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20

INFORMATION REPORT INFORMATION REPORT

CENTRAL INTELLIGENCE AGENCY

S-E-C-R-E-T

50X1-HUM

COUNTRY USSR

REPORT

SUBJECT Technical Information on the 100-mm Tank Gun and Other Armament on the T-54 Tank

DATE DISTR. # October 1960

NO. PAGES 1

50X1-HUM

REFERENCES RD

DATE OF INFO.

PLACE & DATE ACQ.

SOURCE EVALUATIONS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE.

English-language documents (translated from the Russian)

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ATT. NO. 1.

A document entitled "Incomplete Handbook of Russian 100-mm Tank Gun -- Document 'X'." No other publishing data are given. The document provides instructions for the maintenance and operation of the 100-mm tank gun, presenting information on such topics as range tables, sighting the gun, ricochet fire, types of shells and fuses, and includes fire charts for the 7.62-mm tank machine gun. The document contains a partial table of its contents; it lacks an undetermined number of pages; page numbers, indicated by numbers enclosed by parentheses, stop at page 92.

ATT. NO. 2.

A document entitled "Book of Diagrams and Figures." No other publishing data are given. This booklet consists entirely of sketches with legends illustrating the nature of the various parts and mechanisms of the 100-mm tank gun. It contains a total of 24 figures and is 26 pages in length.

Distribution of Attachments:

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Army: Retention (1 copy each attachment)

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X	X	#X	X	X	X	X

(Note: Washington distribution indicated by "X"; Field distribution by "#".)

INFORMATION REPORT INFORMATION REPORT

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BOOK OF DIAGRAMS AND FIGURES

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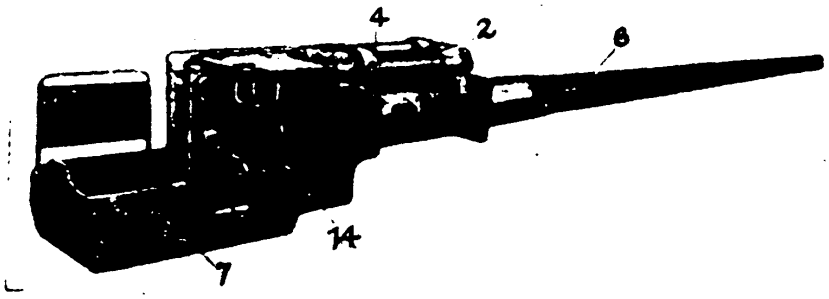

Fig. 1.

General view (from right) of 100 mm tank gun.

2 - Recuperator (S6-07); 4 - Recoil buffer (S6-08);
6 - Barrel (S6-01); 7 - Guard (S6-10);
14 - Breech block.

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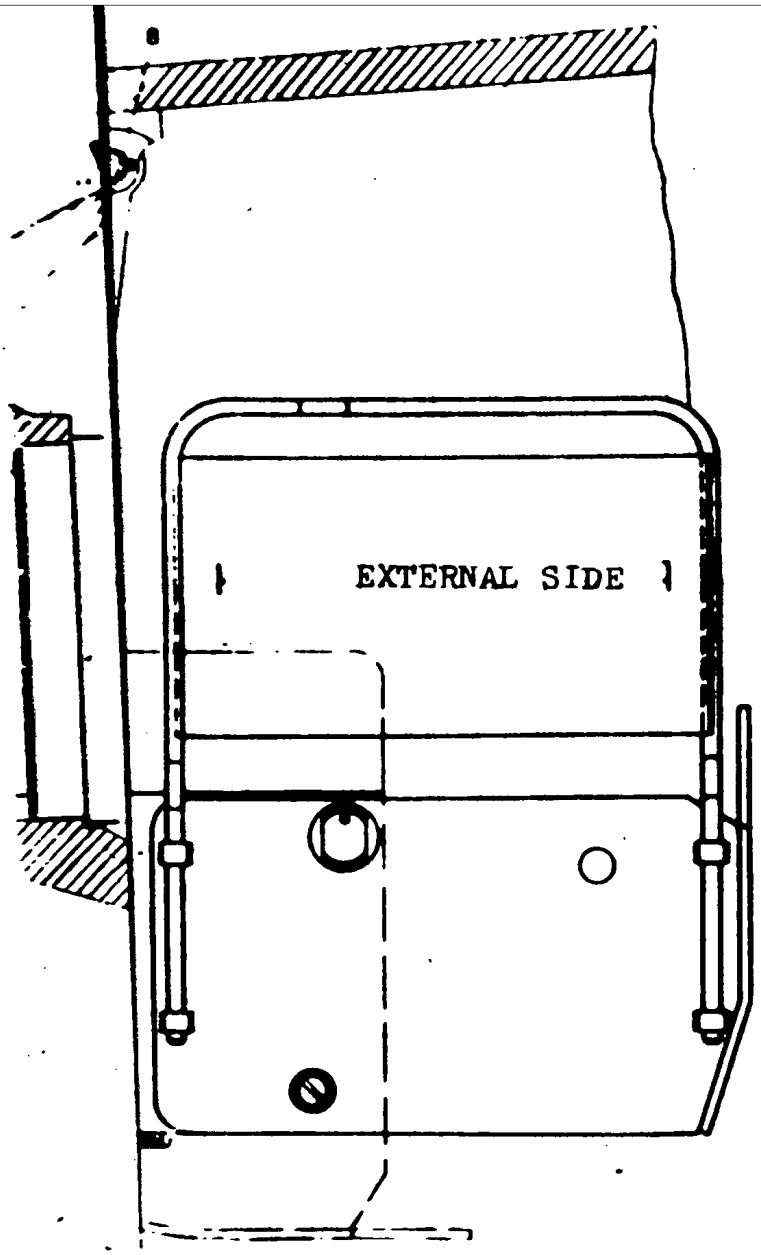

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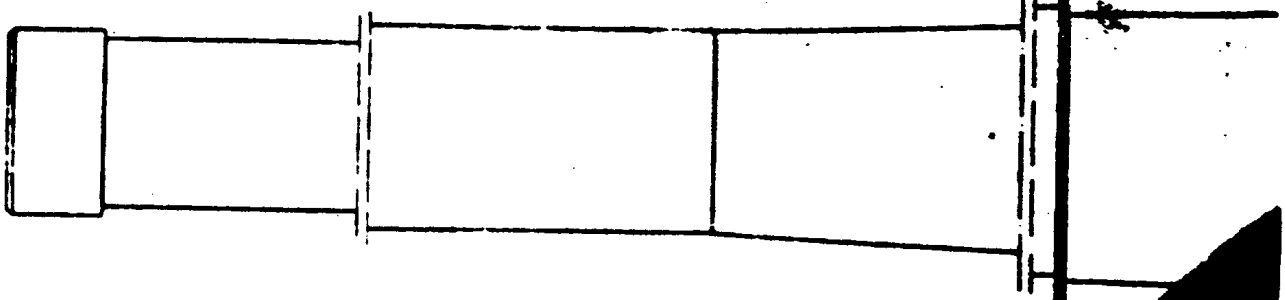

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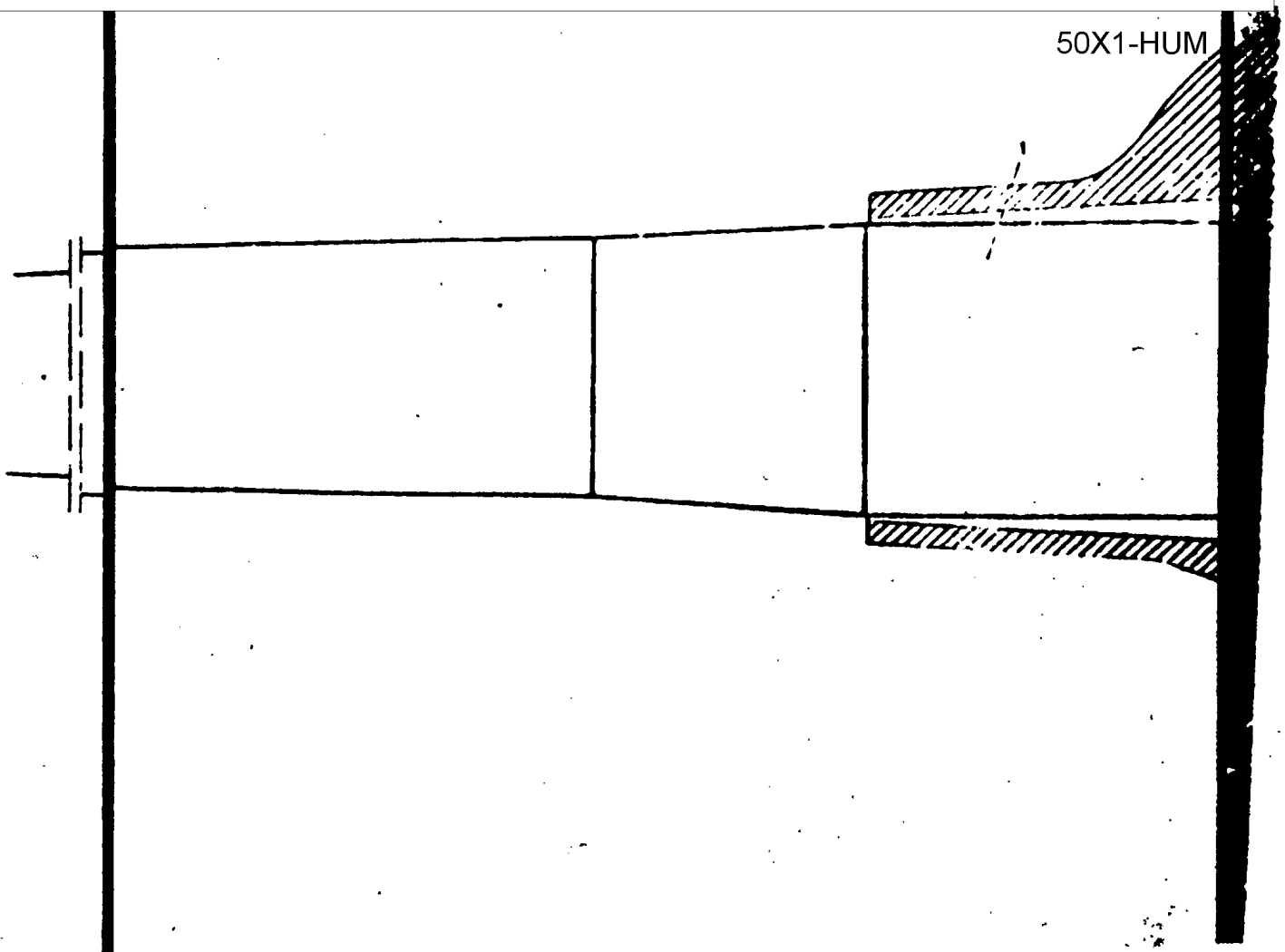

1- barrel (S6 01); 2- recuperator (S6 07); 3- telescopic
7- guard (S6 10); 8- mechanism for bracing the gun in the field 9- opening

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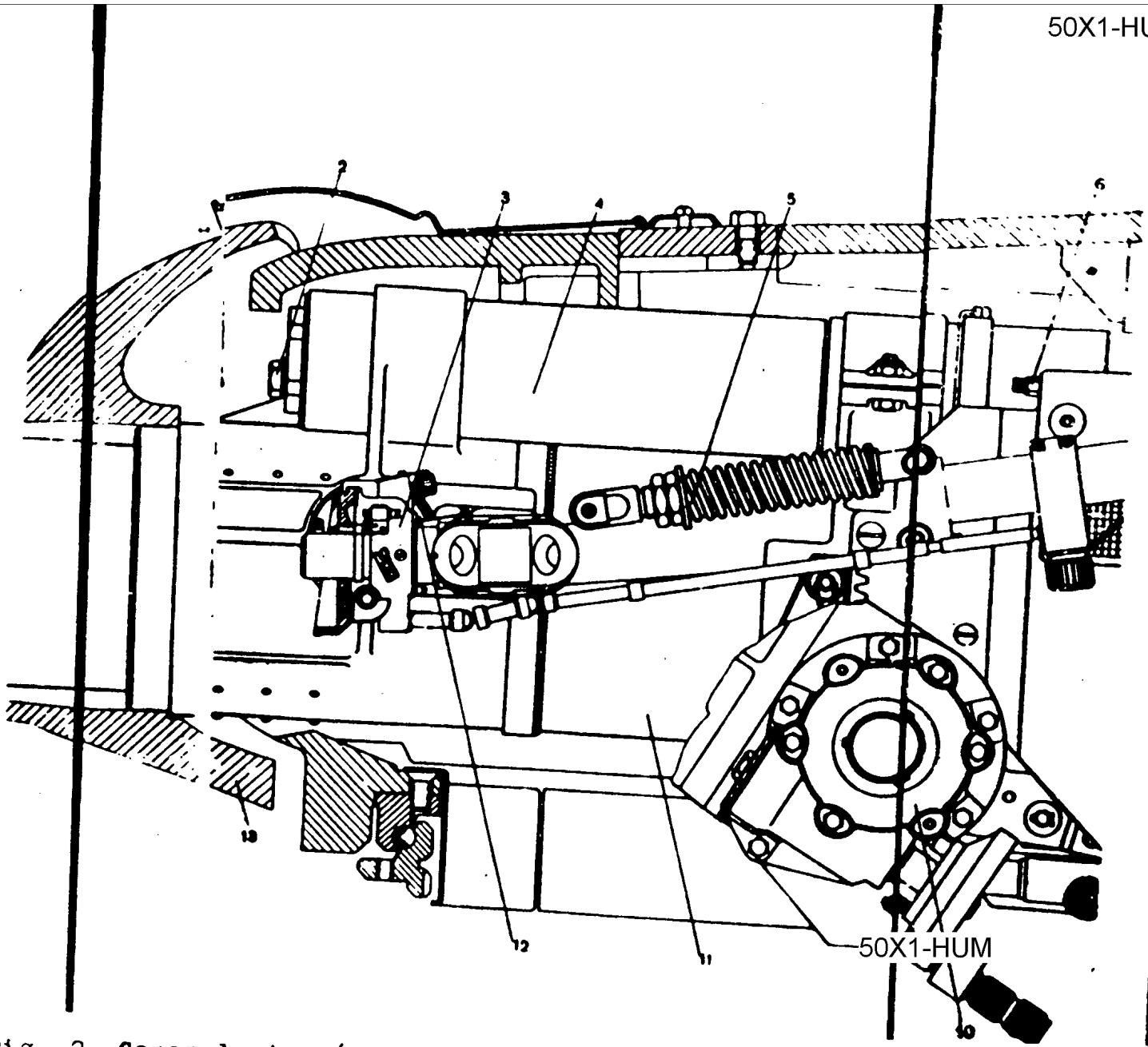

Fig. 2. General view (from left) of 100mm tank gun

sight; 4- recoil brake (6 08); 5- compensating mechanism (S6 113)
6- closing mechanism (S6 02-4)
mechanism, semi-automatic (S6 30); 10- elevating mechanism (S6 09)
11- cradle (S6 09); 12- trunnions (S6 [illegible]); 13- mantlet

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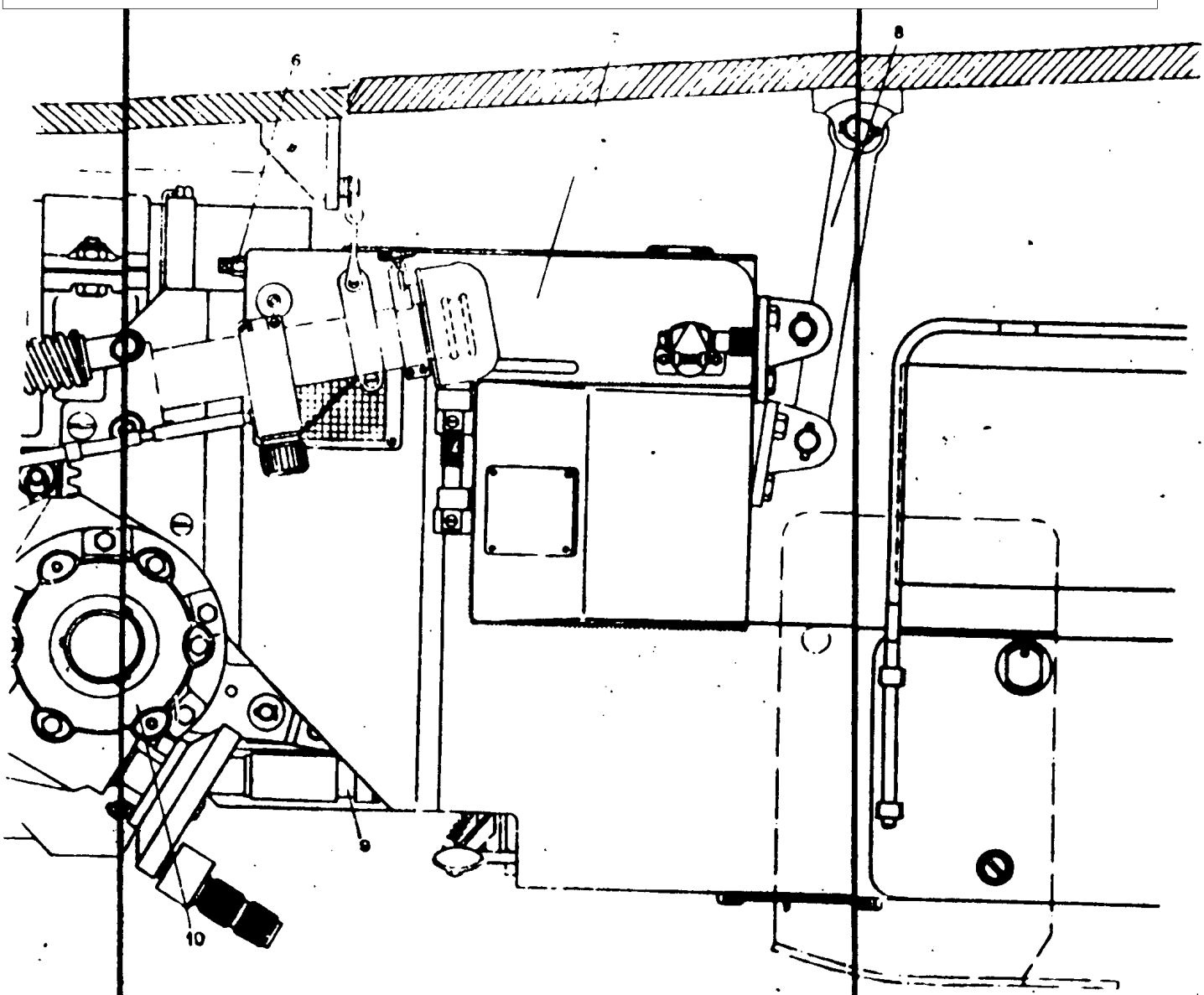

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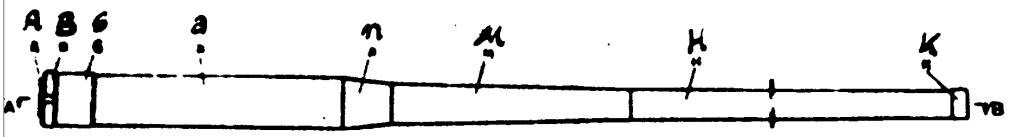
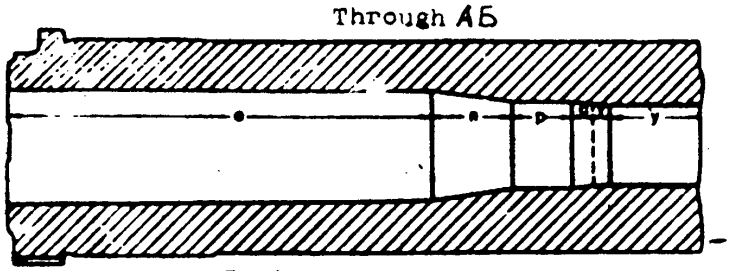
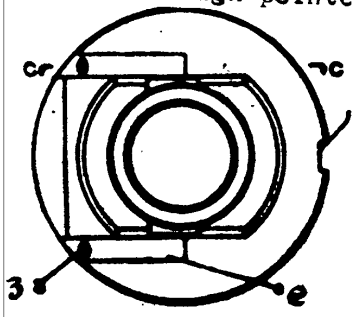




Profile of landes
Number of landes-40
Rifling of uniform twist (right)
Angle of inclination of lande $5^{\circ}58'42''$
Twist of rifling-30 calibers

View through pointer



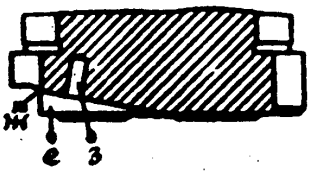


Fig. 4. Tube

а - cylindrical guiding portion; б - cylindrical section; в - collar of tube; г - key seating; д - stop lug for the flange of the shell case; е - horizontal slot; ж - recess for the axis of the extractor; з - cylindrical socket; к - cylindrical collar; л, м, н - conical sections; о - basic cone; п - steep cone; р - small cone; с - stop cone; т - rifled slope; у - rifled section; ф - lande; х - field(?) of the lande; ц - driving edge; ч - nondriving edge.

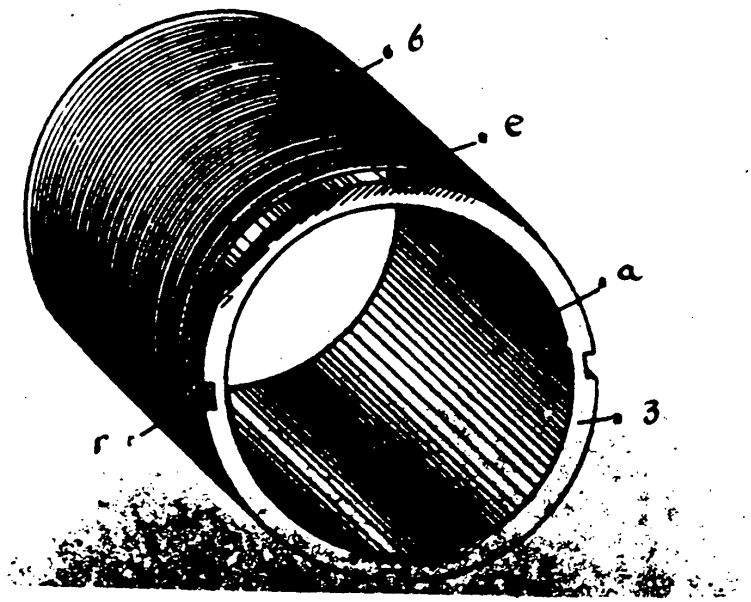


Fig. 5. Sleeve pipe

3 - sleeve pipe; a - cylindrical part; 6 - stop thread
e - notch; r - grooves

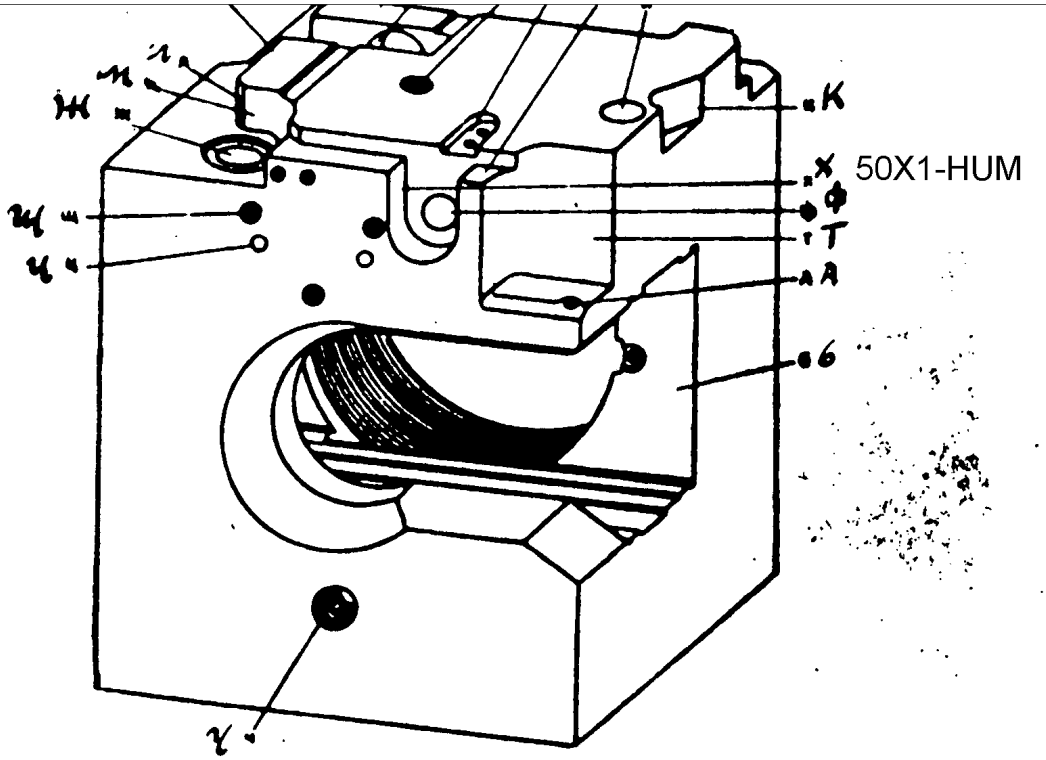


Fig. 6. Breech (view from rear).

б - sliding wedge recess; д - recess for the pin of the operating lever of the breech block; ж - aperture for the axis of the crank; и - aperture for the stop of the catch of the wedge; к - shaped recess for the castor of the VS-11 appliance; л - shoulder for the opening mechanism; м - recess; н - crosspiece; о - buffer piston aperture; п - control platform; р - recess for the stop of the breech block operating lever; с - shoulder for the breech block operating lever; т - operating handle recess; ф - counterrecoil buffer rod aperture; х - recess for the nut of the counterrecoil buffer rod; ц - aperture for the pins; - ч - threaded recess for the ring bolt; ш - threaded aperture.

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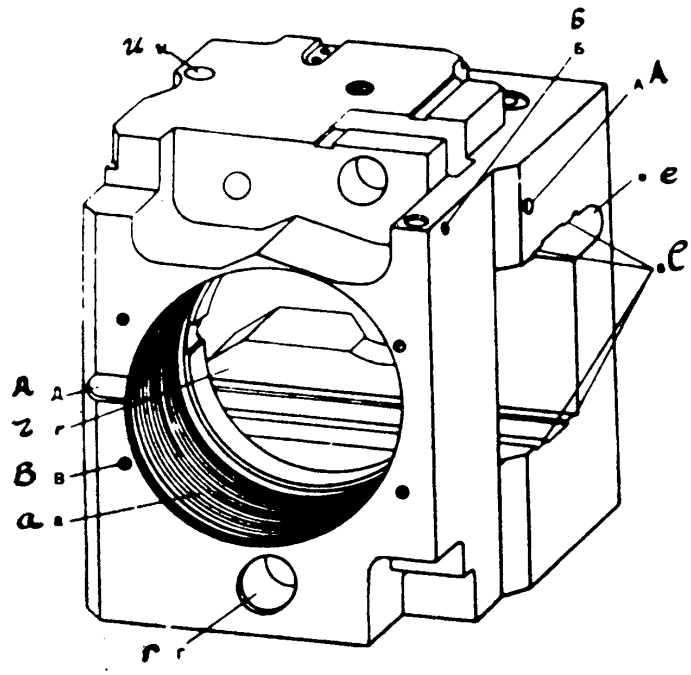

Fig. 7. Breech (view from above

Fig. 7. Breech (view from front and above)
а - threaded recess for junction with the sleeve pipe; б - guiding surfaces; г - supporting wall; е - crank recess и - wedge stop aperture; А - recess for the catch of the axis of the extractor; Б - recess for the catch of the body of the opening mechanism; В - aperture for the screws of the fastening of the buffers; Г - guiding rod recess; Д - recess for the catch of the sleeve pipe.

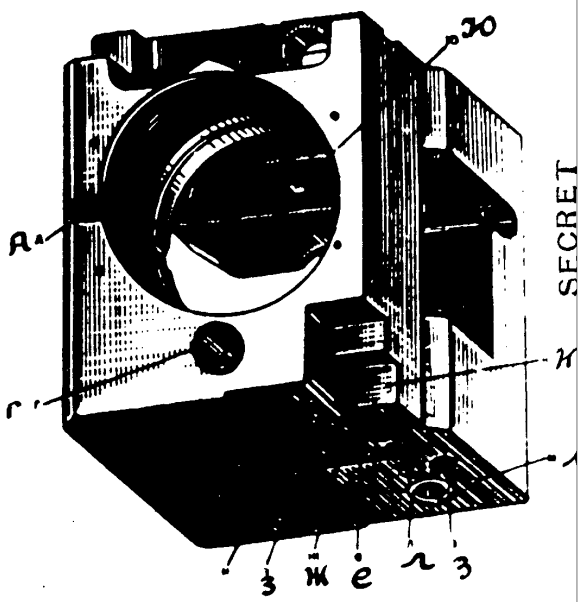

Fig. 8. Breech (view from front and below)
з - extractor axis aperture; л - guiding rod recess; д - recess for the catch of the sleeve pipe; е - plunger aperture; ж - cross-shaped recess; з - threaded aperture for the bolts of the fastening of the semi-automatic rule; и - recess for the fastening of the semi-automatic rule; к - recess for the opening mechanism spring; м - ring-shaped recess under the opening mechanism lever; н - indicator pointer; о - button recess.

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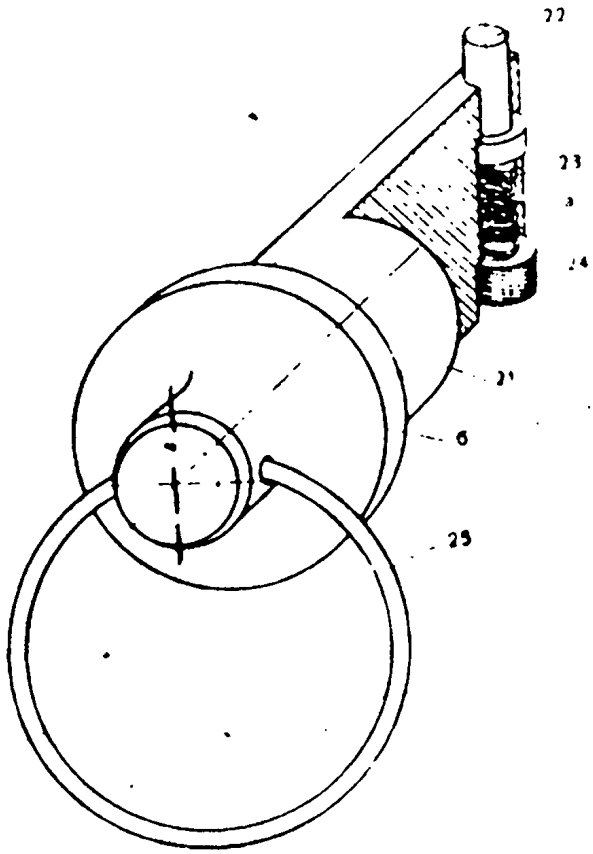


Fig. 9.

Breech ring bracket pin.

21 - Pin (01-24); 22 - Stop (01-26);
23 - Spring (01-25); 24 - Screw (01-27);
25 - Draw ring (01-28); a - Stop inset;
6 - Stop collar.

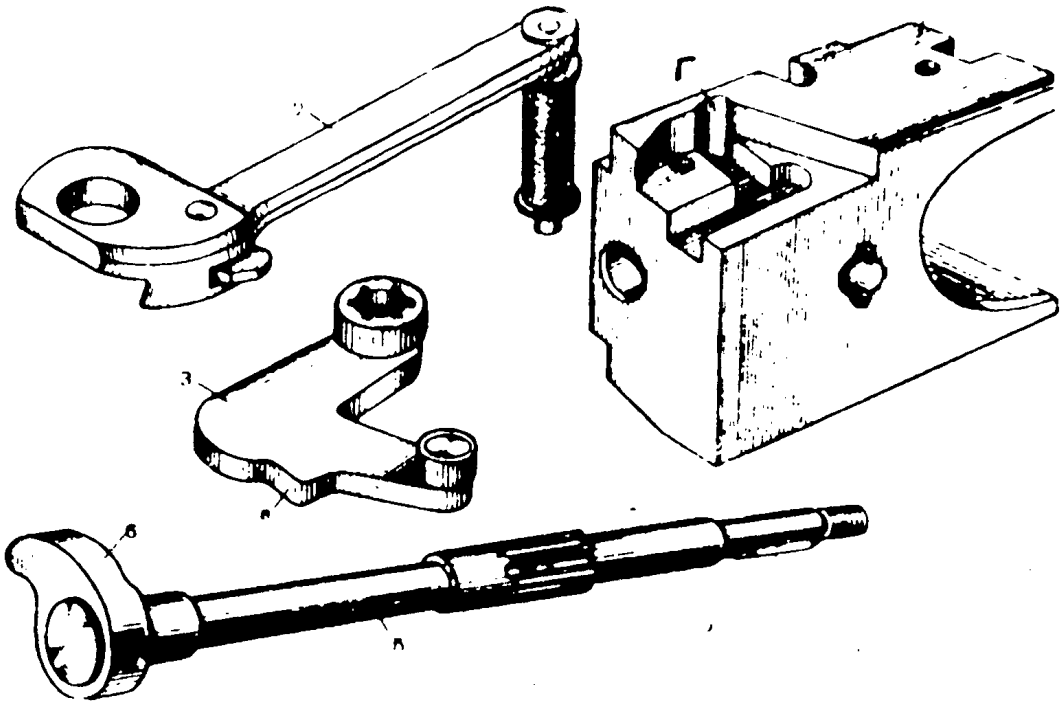
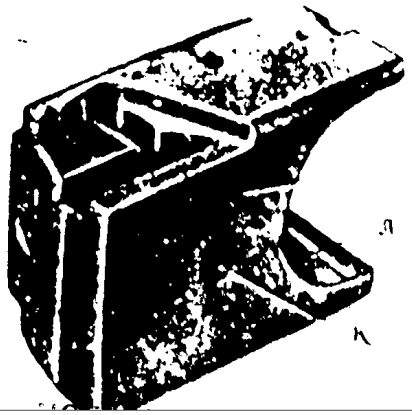


Fig. 10. Parts of the operating mechanism.

1 - Breechblock wedge (02-1); 2 - Breechblock handle (Sb 02-2); 3 - Crank with bearing (Sb 02-3); 5 - Crank axle (02-19); 6 - Semi-automatic cam (30-5); a - Crank tooth; ⌐ - Shaped slot in the wedge for the bearing.



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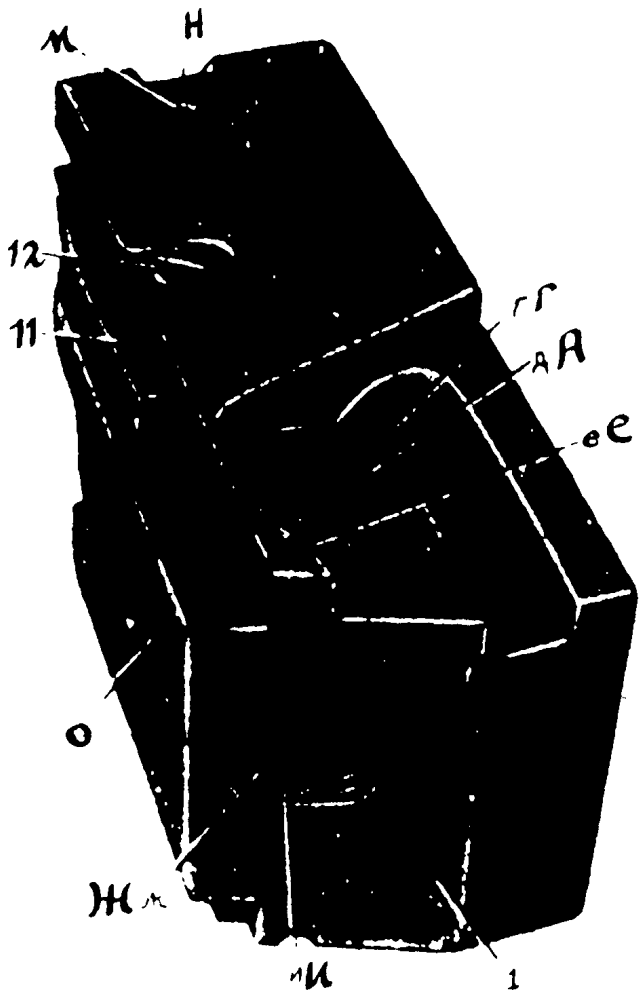


Fig. 12. Breechblock wedge (view from front, above).

1 - Breechblock wedge (02-1); 11 - Extractor cams (02-9); 12 - Screws (02-10); г - Shaped slot for the bearing of the crank; А - Inset for the sear axis; е - Aperture for the knob of the sear stop; Ж - Inset for the firing pin sear; К - Inset for the sear stop; М - Aperture for the shaft; Н - Notch for the wedge catch; о - Wedge face.

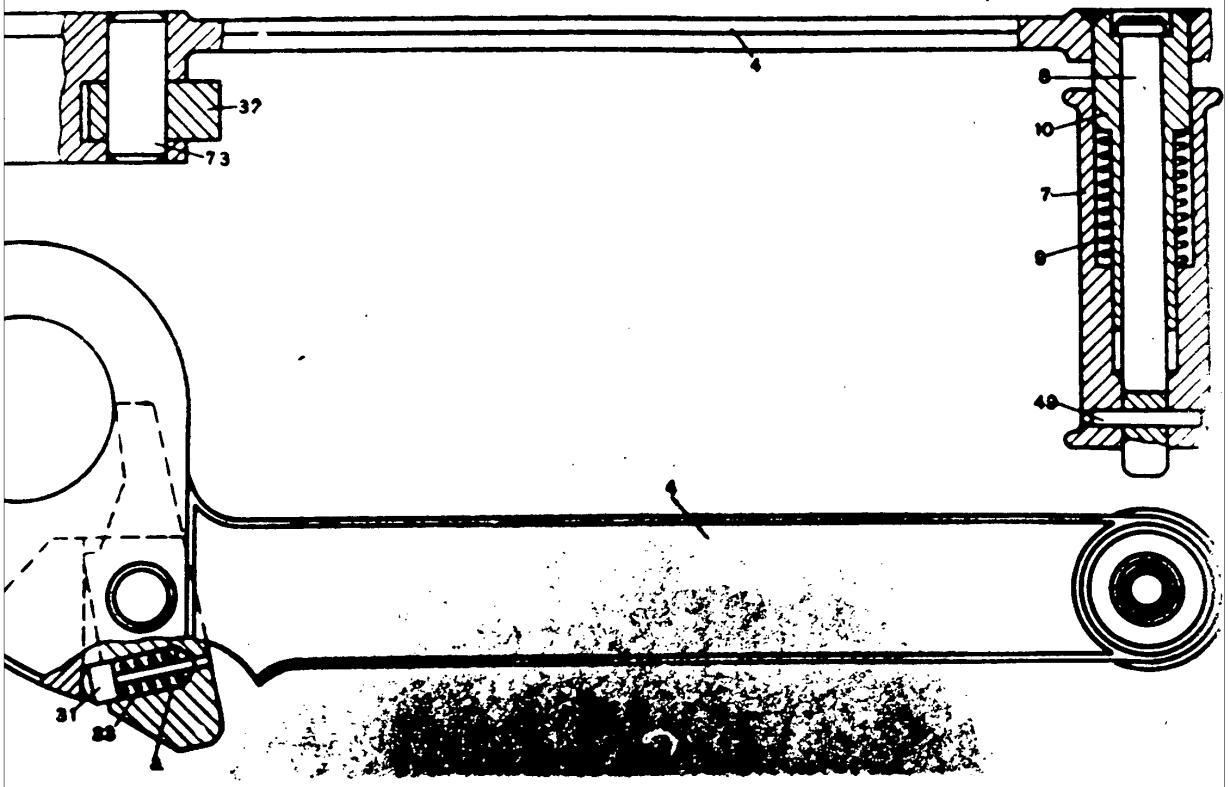


Fig. 13. Breechblock handle.

4- handle (02-25); 7- shaft (02-27); 8- rod (02-28); 9- shaft spring (02-23); 10- shaft axis (02-26); 31- piston (02-18); 32- catch of the handle (02-21); 33- spring (A51230-10); 49- pin (A51041-13); 73- catch axis (02-90); a- inset for the piston and the spring.

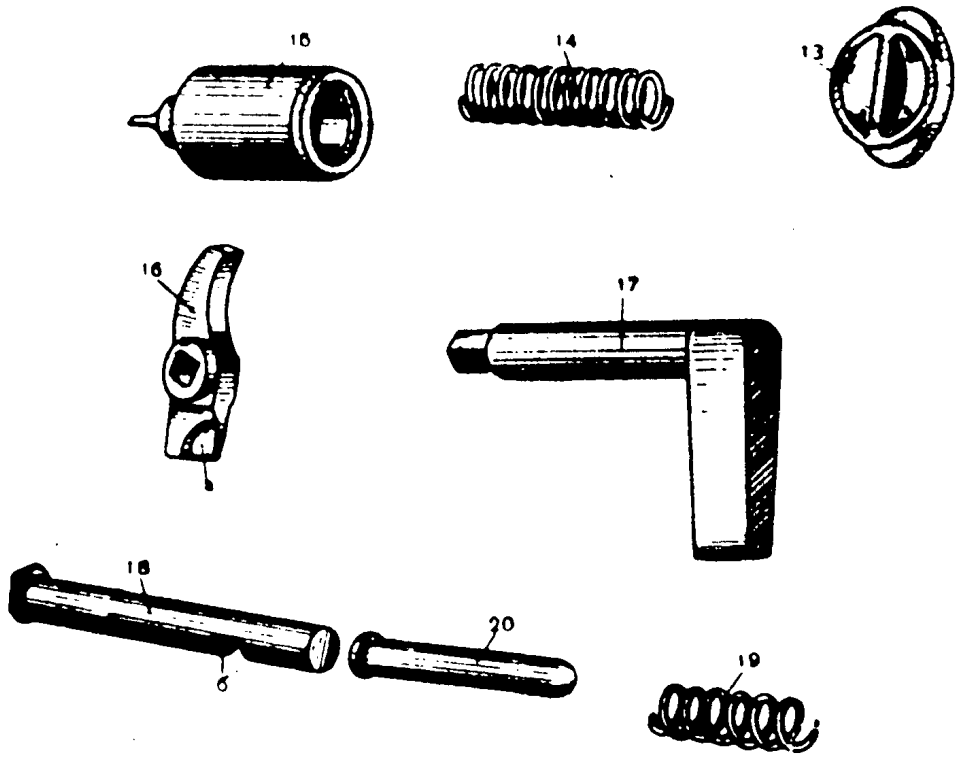


Fig. 14.

Parts of the firing mechanism.

13 - Firing pin cap (A52150-9); 14-Firing spring (02-7);
15 - Firing pin (A51605-3); 16 - Firing pin sear (02-4);
17 - Sear axis (02-5); 18 - Sear stop (02-3);
19 - Knob spring (A51230-13); Knob (02-78);
а - Notch for sear stop; *б* - Notch for the end of the firing pin sear.

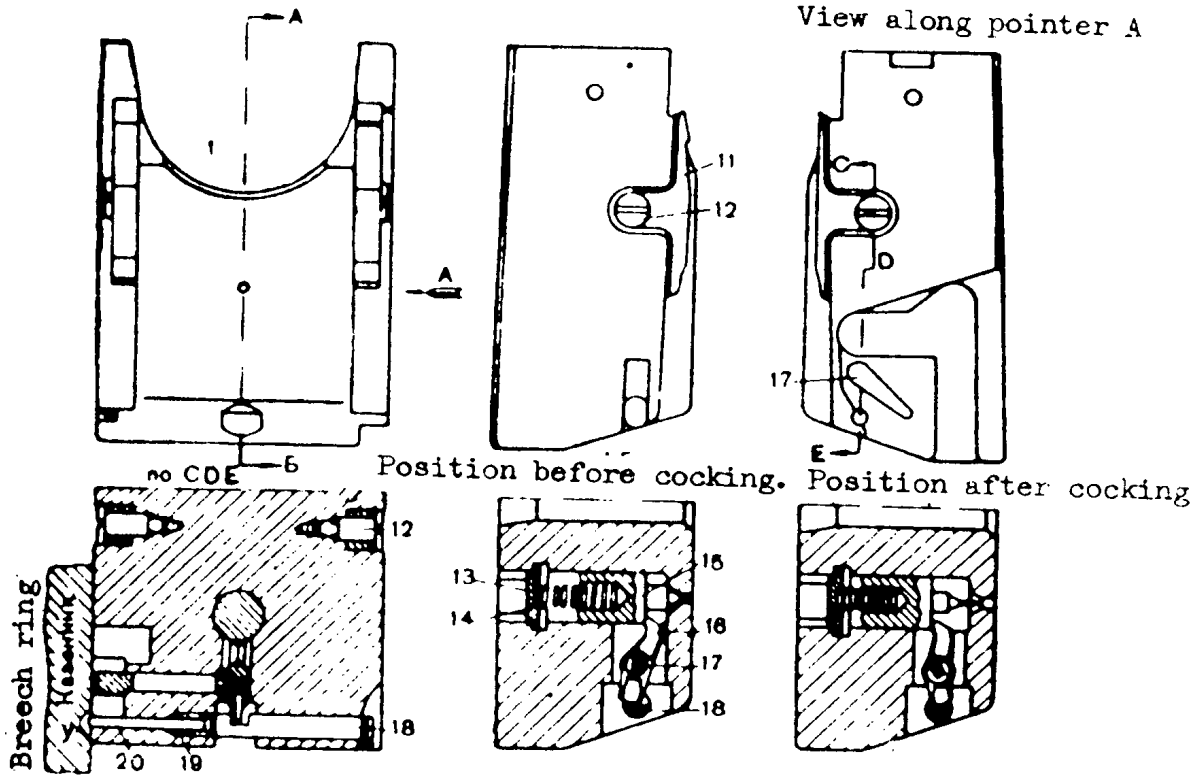
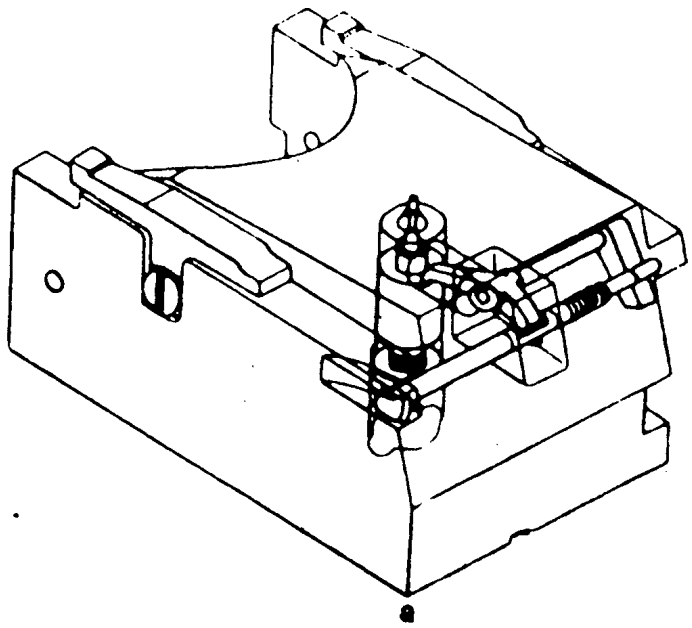
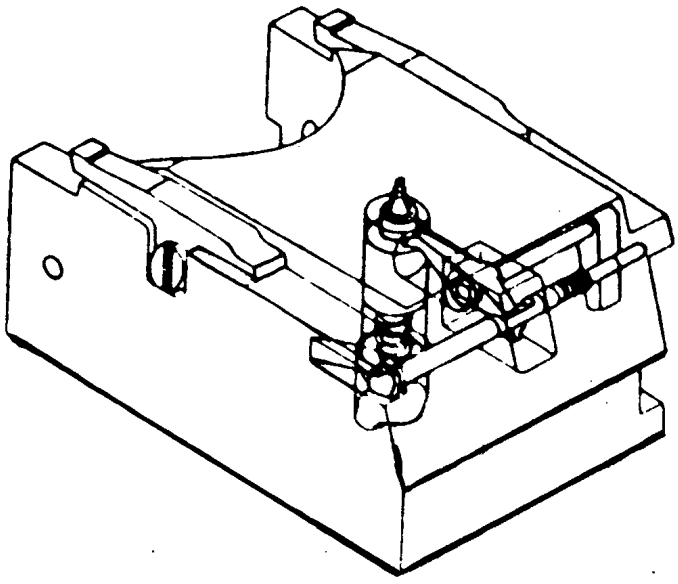


Fig. 15. Breechblock wedge with firing mechanism.

1 - Breechblock wedge (02-1); 11 - Extractor cam (02-9);
12 - Screw (02-10); 13 - Firing pin cap (A52150-9);
14 - Firing spring (02-7); 15-Firing pin (A51605-3);
16 - Firing pin sear (02-4); 17 - Sear axis (02-5);
18 - Sear stop (02-3); 19 - Knob spring (A51230-13);
20 - Knob (02-78); y - Sloping recess.



а



б

Fig. 16.

Disposition of the parts of the firing mechanism in the breechblock wedge:
а - Firing mechanism in the cocked position;
б - Firing mechanism in the fired position.

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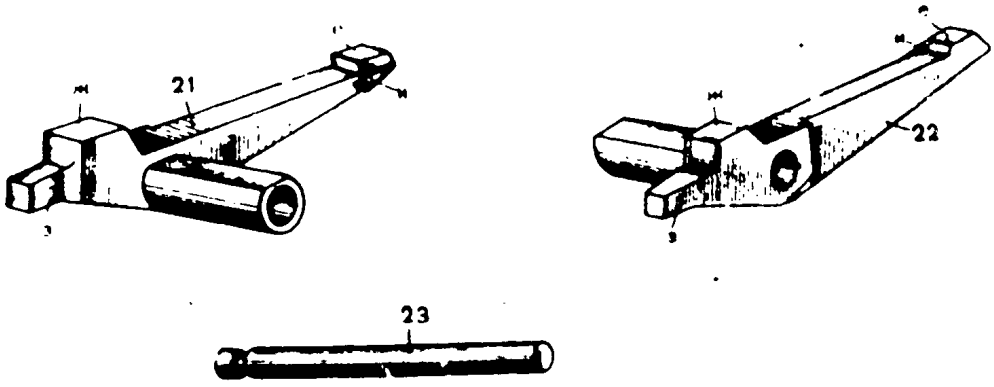

Fig. 17.

Parts of the extractor mechanism:

21 - Upper extractor (02-87); 22 - Lower extractor (02-88); 23 - Extractors' axis (02-16);
e - Extractor hooks; Ж - Lugs; u - Grips;
3 - Branches.

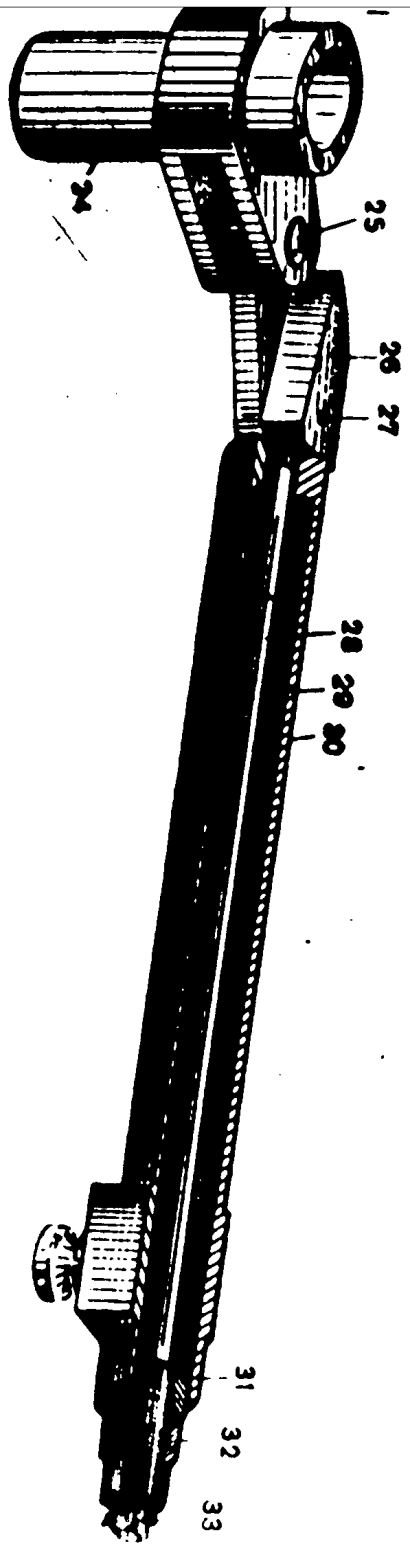

Fig. 18. Closing mechanism.
24-closing mechanism lever (02-32); 25-axis (A51610-24); 26-link (02-37); 27-pin (A51042-51); 28-rod (02-34); 29-spring (02-25); 30-socket (02-33); 31-rod sleeve (02-36); 32-guiding nut (02-89); 33-split pin (A51040-19); ✱ -shoulder.

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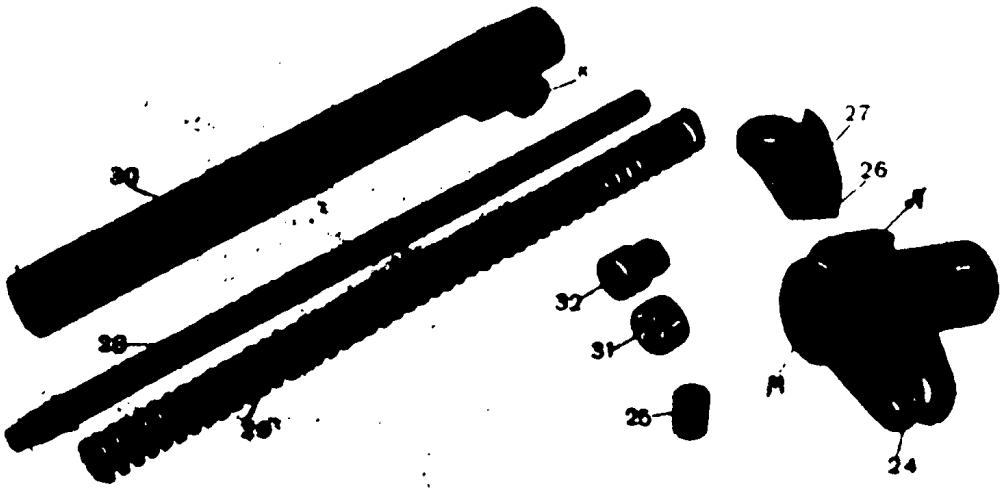

Fig. 19.

Parts of the closing mechanism.

24 - Closing mechanism lever (02-32); 25 - Axis (A51610-24);
26 - Link (02-37); 27 - Pin (A51042-51); 28 - Rod (02-334);
29 - Spring (02-35); 30 - Socket (02-33);
31 - Rod sleeve (02-36); 32 - Guiding nut (02-89);
n - Shoulder; M - Key bed; K - Tongue of the socket of the closing mechanism.

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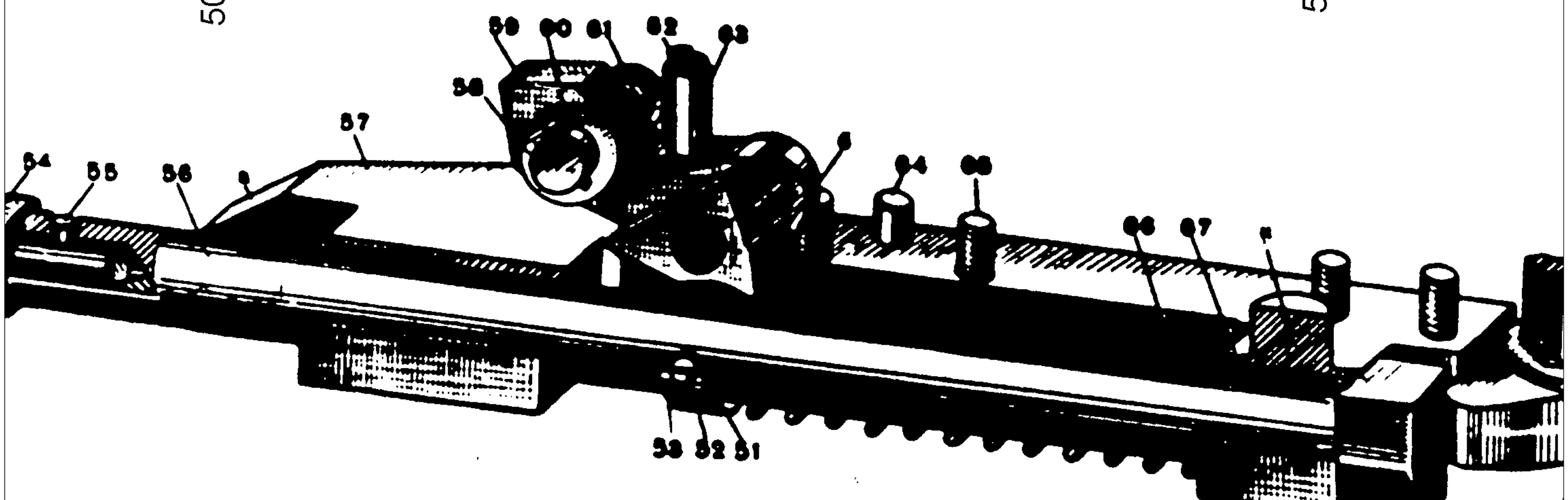

Fig. 20. Opening mechanism:
6-semi-automatic cam (30-61);51-collar (30-62);52-stopping screw (30-59);53-ring (30-60);54-stay (30-52); 55-pin (A51041-35);56-ram (30-58);57-rule (30-56);58-washer (A51020-27);59-stop with roller (Sb 30-11); 60-split pin (A51020-27);61-pin (30-8);62-spring (30-5); 63-socket (30-6);64-pin (A51041-46);65-bolt (A51002-50); 66-spring (30-55);67-bushing (30-37);а-bevel for the roller of the automatic stop;б-lug;к-ruler tongue.

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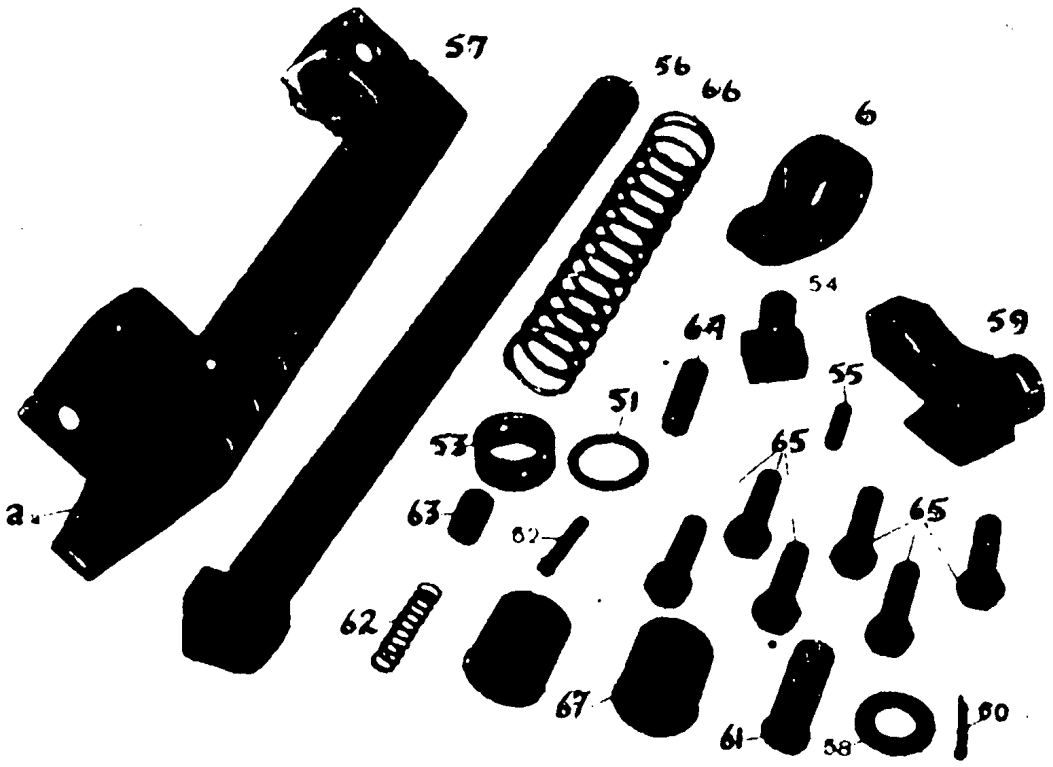

Fig. 21.

Parts of the opening mechanism.

6 - Semi-automatic cam (30-61); 51 - Collar (30-62);
52 - Stopping screw (30-59); 53 - Ring (30-60);
54 - Stay (30-52); 55 - Pin (A51041-35); 56 - Ram (30-58);
57 - Rule (30-56); 58 - Washer (A51020-27);
59 - Stop with roller (Sb 30-11); 60 - Split pin
(A51040-28); 61 - Pin (30-8); 62 - Spring (30-5);
63 - Socket (30-6); 64 - Pin (A51046); 65 - Bolt
(A51002-50); 66-Spring (30-55); 67 - Bushing (30-57);
a - Bevel for the roller of the semi-automatic stop;
K - Ruler tongue;

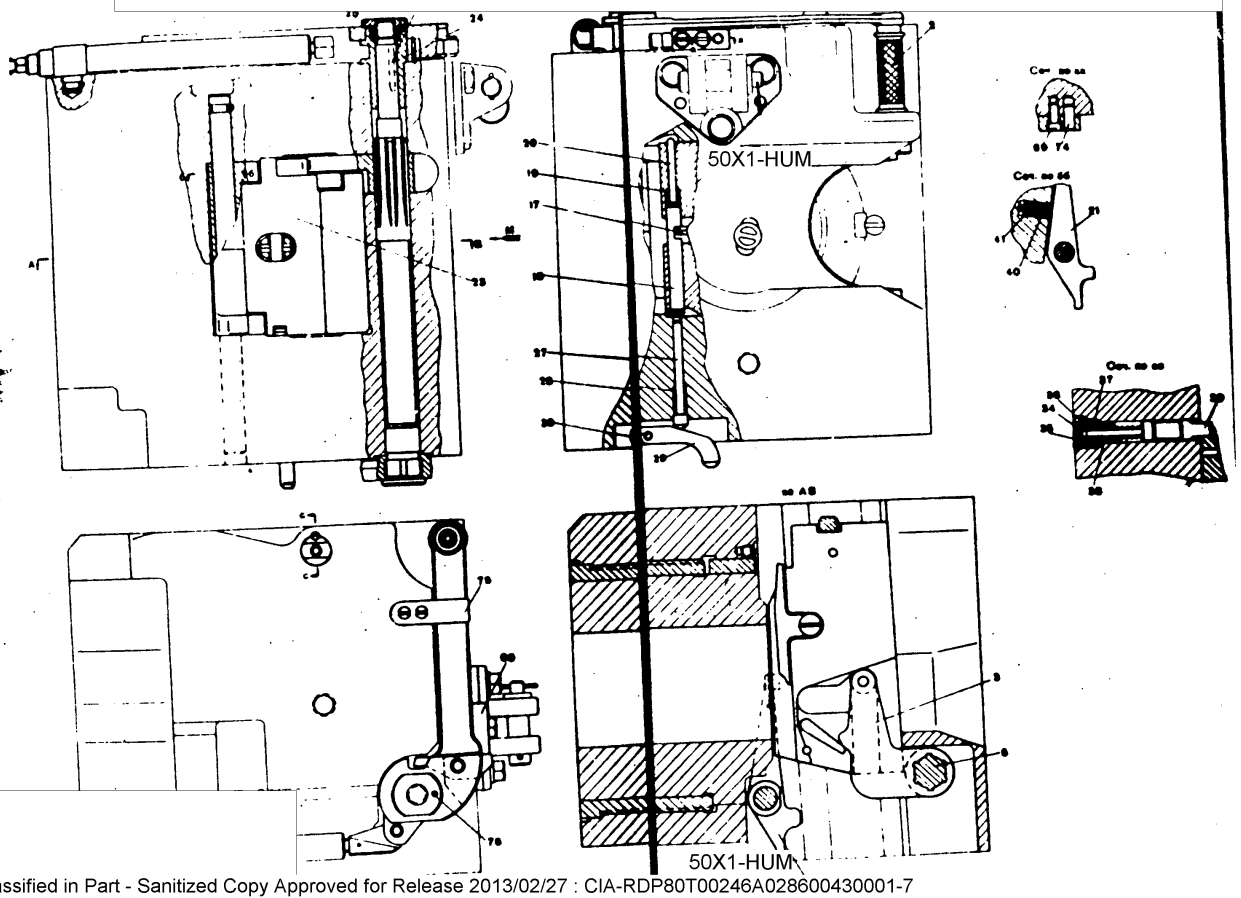

Fig.22. Breechblock in
ctional view and the
position of its parts in the
n.
- Breechblock lever (S6-02-2)
- Crank with castor (S6-02-5)
Crank axis (02-19)
7 - Axis of sear of firing pin
): 18 - Firing pin sear stop
2-3): 19 - Button spring
51230-13): 20 Button (02-18)
Upper extractor (02-37)
- Lower extractor (02-38)
23 - Axis of extractors (02-16)
- Closing mechanism lever
-32): 25 - Tightening bush
02-20): 26 - Dowel (A51050-34)
- Push rod (02-13)
- Push rod spring (A51230-12)
- Release lever (02-60)
- Pin (A51041-157)
- Pin (A51041-105)
- Stop tip (02-12): 36 - Screw
1065-40): 37 - Stopping bush
-17): 38 - Stop spring
30-15): 39 Wedge stop(02-11)
Socket (02-76): 41 - Spring
: 42 - Axis stop of
extractors (02-24): 43 - Socket
stop of closing mechanism(02-22)
- Screw (A51062-93): 74 - Pin
A51041-35): 75 - Lever arrester
02-91): 76 - Screw (A51064-23)

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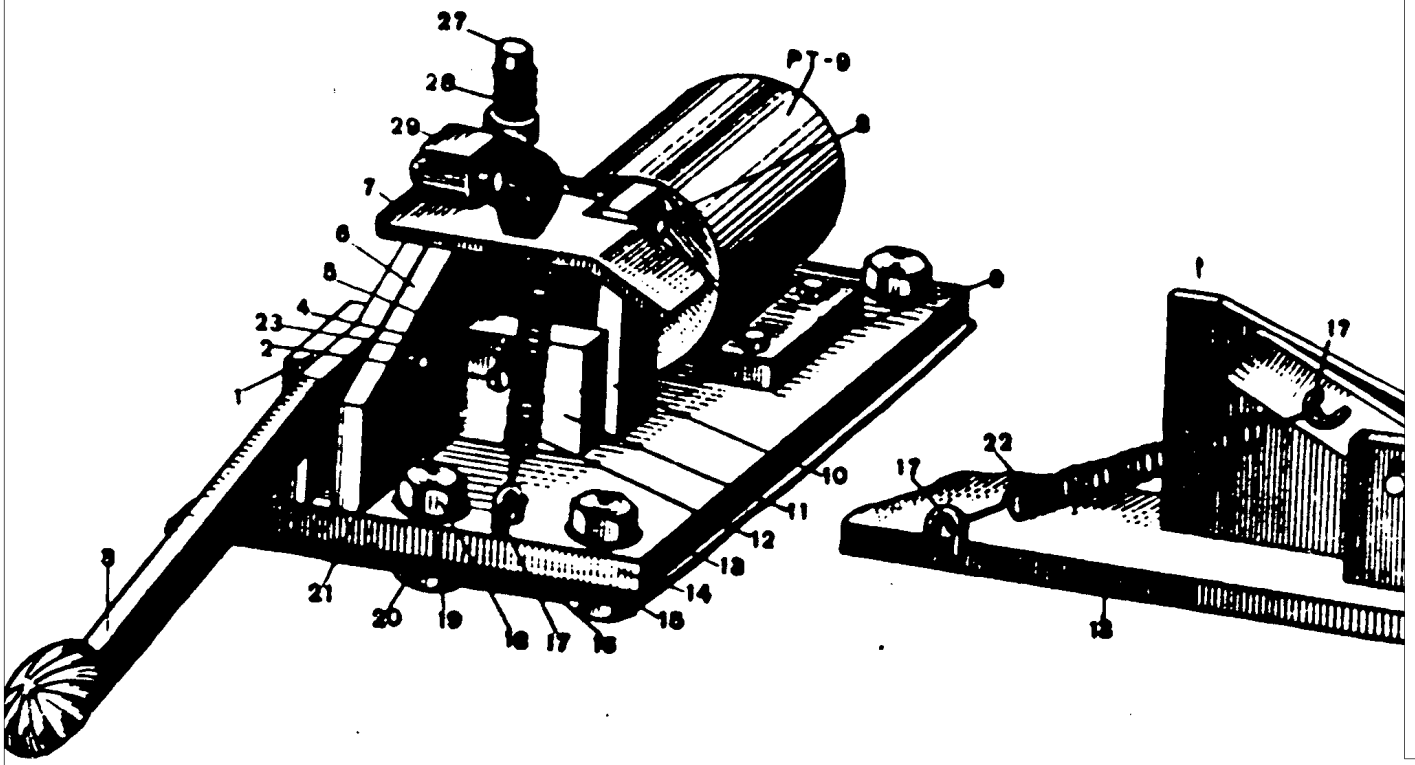

Fig. 23. Release mechanism :

1 - brace (10-135);2-screw (10-233);3-lever with button (S6 10-50);4-nut (A51012-3); 5-stopping washer (A51027-4);6-brace (10-132);7-clamp (S6 10-23);8-clamp axis (10-136);9-pad (10-188);10-brace (10-133);11-baffle plate (10-232);12-clamp spring (10-178);13-plate (10-231);14-base (10-164);15-pads (10-199);16-stopping washer (10-234);17-lug (10-134);18-bolt (A51000-29);19-washer (A51020-24);20-nut (A51012-5); 21-lever axis (10-41);22-lever spring (10-34);23-cotter pin (A51040-9);27-push rod (02-13);28-push rod spring (A51230-12);29-release lever (02-60);RT-9 -electromagnet.

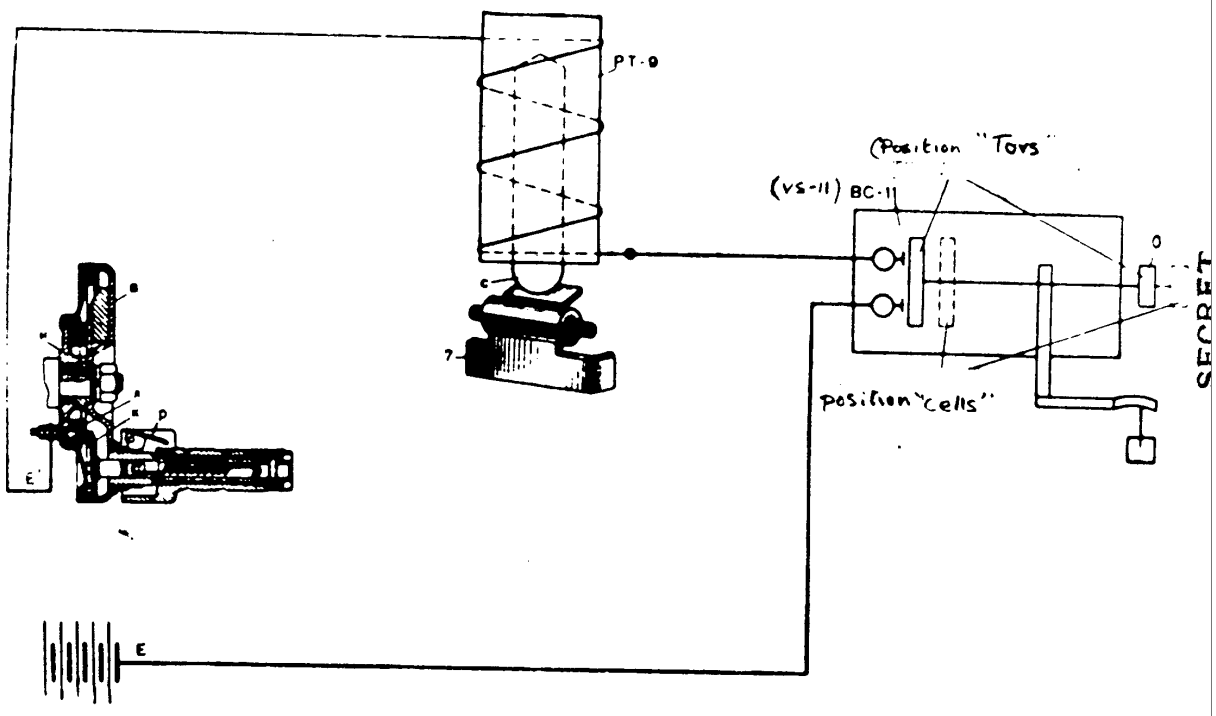

Fig. 24. Diagram of electrical trigger mechanism

7-clamp (S6 10-23); RT-9 -electromagnet; A-accumulator; E & E'-electrical wires; -static part of flywheel; -moving terminals; -contact ring; -flywheel of elevating mechanism; -electrical trigger mechanism lever; -core relay; VS-11 -locking instrument; -button of VS-11 instrument.

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Table of armour-piercing quality.

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NOFORN/NO DISSEM ABROAD/LIMITED/BACKGROUND USE C
NOFORN/CONTD CONTROL

Range m.	Thickness of armour being pierced, mm AP-Tracer Shell BR-412D	
	Muzzle velocity 887 m.per sec.	
	Angles of impact	
	60°	90°
500	150	200
1000	140	185
1500	130	170
2000	120	155
3000	100	125

The "angle of impact" means the angle obtaining between the trajectory at the point of impact and the plane of the surface of the target at the same point.

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Sh. FIRING TABLES

1. ARMOUR-PIERCING - TRACER SHELL BR-412D
(with AP and ballistic caps)
FULL CHARGE, DBR-2 FUZE.

2. HEAVY BULLET FIRED FROM A TANK MACHINE GUN
1943 model.

Sh. FIRING TABLES.

1. ARMOUR-PIERCING SHELL.

2. HEAVY BULLET FIRED FROM A MACHINE GUN.

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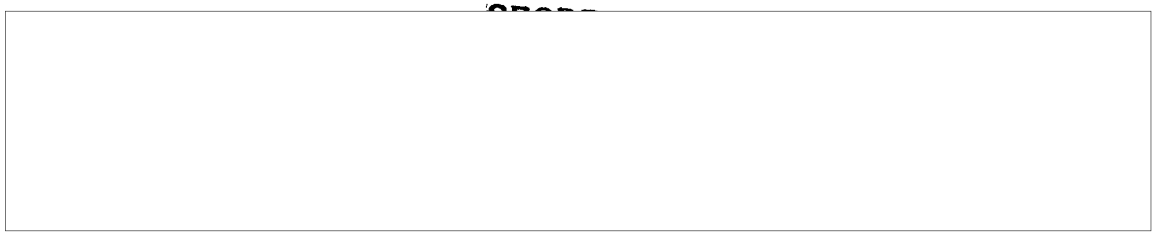
SECRET

INCOMPLETE HANDBOOK OF RUSSIAN 100mm TANK GUN

DOCUMENT "X"



I - FIRING FORBIDDEN

erial	Type of conditions	Type of round	Type of charge	Reason (for firing being forbidden)
1.	Using the RGM-6 fuse with a broken or perforated diaphragm	HE - fragmentation	All	Premature explosion of the shell is possible.
2.	Using the RGM-6 fuse without a waterproof cover during heavy rain or hail	HE - fragmentation	All	Possible premature explosion in flight.
3.	Cracks on the base or in the body of the shell case - irrespective of the size or number of cracks.	All	All	Propellant gases may blow back through the breech-blo
4.	Leak of explosion through the fuse-hole under the fuse.	HE fragmentation	All	Possible premature explosion.
5.	Inadmissible dents on the ballistic cap, driving band@ and - @ of the ballistic cap. (Russian word not translated - PROVOROTA)	AP tracer	All	Possible damage to the bore or inaccurate shooting.
6.	If a wooden or plastic filling plug is screwed in instead of the fuse.	HE fragmentation	All	Possible premature explosion in the bore or when striking the barrier. @

(4)

2. FIRING INSTRUCTIONS

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1. Against armoured targets, AP tracer shells shoul

When AP tracer rounds are not available, the HE- fragmentation shell OF-412 may be fired, using fuse with waterproof cap and setting at "0".

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2. The range tables are compiled for painted shells with fuse without waterproof cap. When firing unpainted shells, and also those which have waterproof caps, the shells should not be painted, and adjustments should not be made to the fuse cover, because there are not many of them [in existence].

3. Corrections for the charge temperature (x T3) in the range tables are made for full charge, as adapted to nitro-glycerine propellant. During firing with full charge, made of Pyroxylin type 100/56, the table corrections should be multiplied by 0.7.

4. While the tank is crossing obstacles (ditches, streams, ravines etc) the gun barrel should be raised at such an angle that the muzzle cannot be buried in the ground.

3. THE RANGE TABLES

(5) The present range tables are intended for use when firing the 100mm tank gun D-10T and compiled on a basis of controlled test firings.

Data prescribed as the basis of range tables

Type of shell	Charge	Quadrant elevation	Angle of Jump	Calibre Radius Head	Mean deviations [tolerances]				
					From Q.E.	From the horizontal plane	From Muzzle velocity	From ballistic coefficient	From origin
		degrees	minutes		1000ths	1000ths	%	%	-
HE - fragmentation shell OF-412 (fixed round)	Full	5	0	1.022	0.20	0.30	0.15	0.30	00007
		10		1.036					
		20		1.037					
AP-tracer round BR-412D APCBC	Full	2	0	1.302					

NOTES ON THE RANGE TABLES

1. One thousandth (One division on the range cone) = 1/6000 of the circumference = 3.6 minutes.

2. Signs for corrections for charges in meteorological and ballistic factors are:-

A. Line

(a) Origin - ;

(b) side wind from the right +; from the left -.

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(c) Ballistic deviation for air temperature; Positive +, Negative -.

(d) Deviation in muzzle velocity; muzzle velocity greater +, muzzle velocity less -.

(e) Deviation in charge temperature; Positive + Negative -.

C. Correction for weight of shell

Multify the tabled correction with its sign, algebraically by the deviation in the weight of the shell (the number of signs on the shell) adjust the range accordingly.

Example

Table correction - minus 20.

On the shell are the weight signs (+++) Multiply as follows:

$(-20) \times (+++) = (-20) \times (+3) = -60.$

The correction is minus 60. Decrease the range by 60 metres.

Normal (standard) conditions are considered to be

A. Topographical conditions

(a) The point of fall is on the same plane as the gun (i.e. the angle of sight is nil and the Quadrant elevation is equal to the Range Table Target elevation);

(b) There is no inclination of the axle rod.

B. Ballistic conditions

(a) Range table velocity is the velocity to be expected from a standard shell fired from a new barrel;

(b) Charge temperature $T_3 = +15^{\circ}$;

(c) The weight of the shell (finally prepared) is as according to the table;

(d) The shape of the shell and fuze corresponds to that shown in the diagram.

C. Meteorological conditions

(a) Still atmosphere (wind speed at all heights nil)

(b) Barometric pressure at the gun position (and on the level of the gun) how = 760mm

(c) Air temperature at the gun position (and on the level of the gun) tow = $+15^{\circ}$.

4. THE GUN

Instruction on the operation of the gun

1. Ensure that the recoil and recuperator cylinders are topped up with fluid.

3. It is essential that the bore is carefully cleaned before firing, and grease which might lead to deterioration of the rifling and barrel expansion removed.

4. Do not forget to remove the muzzle-cover before firing, otherwise a premature explosion of the shell may occur.

5. Do not allow dirt and sand to get into the barrel.

6. Ensure that there is nothing extraneous in front of the barrel or in the path of the shell (twigs, wires etc) which might cause a premature explosion of the shell.

7. Do not fire if the gun does not run out, or if the recoil is too short or too long.

5. SIGHTS

(7)

The 100 mm tank guns have the T Sh 2 - 22 sight for direct fire, and a clinometer with scale in "thousandths" for indirect fire. The sight has 4 range scales for firing with the 100 mm gun D-10T - the scale $\frac{OF}{POLN}$ for firing with the HE fragmentation fixed shell OF-412 on full charge;
The scale $\frac{BR}{412B}$ for firing with the AP tracer round BR-412D;
The scale $\frac{GT}{T}$ for firing cartridges with heavy bullets from the 1943 pattern 7.62mm MG.

The scale $\frac{OF}{UMEN}$ is not used for firing.
The scales of the T Sh2-22 sights are marked for an angle of jump of zero minutes.

The T Sh2-22 sights have the marking "TSh2-22 for the 100mm tank gun D-10T".

Since the time that reduced charge firing has been discontinued, the scale $\frac{OF}{UMEN}$ has not been marked on the sight graticule.
On the graticule of the T Sh2-22 sight, which has no $\frac{OF}{UMEN}$ scale, the scale $\frac{OF}{POLN}$ is marked accurately after zeroing; and the scale for firing AP-tracer BR-412D is designated BR/412D.

In the range tables for the HE fragmentation shell for full charge, the setting of the sight T Sh2-22 is indicated according to the old scale $\frac{OF}{POLN}$
The sight setting according to the new amended scale in the range tables is not shown, since this is a range scale i.e. one division on the scale corresponds to 100m

6. RICOCHET FIRING

(8)

Ricochet firing with HE fragmentation shells should be carried out with the following fuze setting.

RGM and RGM-6 with waterproof cap, "3" using this (setting), the angle of arrival must be not less than 2° and not more than 20° when firing at ground targets, and not more than 10° when firing at targets on water.

It must be borne in mind that during ricochet firing at short range, there may be a higher percentage of fuze failures.

Type of shell and code number	Fuse	Weight of shell with fuse in KG	Length of shell without fuse in calibres	Weight of explosive charge in KG
HE fragmentation shell OF-412 (fixed round)	RGM-6 RGM	15.60	4.29	1.460
AP tracer shell BR-412D (with AP and ballistic caps)	DBR-2	15.88	3.90	0.061

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The principal distinguishing mark of the shell is the code number which is marked on the shell case.

2. FUSES

Type of Fuse	Type of operation of shell required	Order	Setting for firing		Normal (Basic) Setting
			CAP	FUSE	
RGM-RGM-6	Fragmentation	"Fragmentation"	OFF	To "0"	Cap on,
	H.E.	"H.E."	ON	To "0"	Setting at
	Ricochet or H.E. withdelay	"Delayed"	ON	To "3"	"0"
DBR-2	No setting required				

In case of failures during HE - fragmentation firing with the RGM and RGM-6 fuses set at "3", the fuse setting should be charged to "0".

During heavy rain, HE fragmentation shells with RGM and RGM-6 fuses must not be fired without the waterproof cap, because there may be a premature explosion during flight.

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3. CHARGES

Type of charge	Type of shell to be fired	Type of Propellant	Approximate weight of charge without igniter KG	Pressure of Propellant gases KG/CM^2	Muzzle velocity metres/sec.
FULL	HE-fragmentation shell OF-412 (fixed round)	NDT-3 18/I	5.50	3000	900
	AP tracer shell BR-412D (with AP and ballistic caps)	NDT-3 18/I	5.50	3000	887

NOTE

The charge weights are given as a guide. They may vary accoring to the ammunition lot or type of propellant.

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Code number of round	Code number of shell	Type of shell	Fuse
UOF-412	OF-412	HE fragmentation (fixed round) full charge	RGM-6 RGM
UBR-412D	BR-412D	AP tracer shell with AP and ballistic caps	DBR-2

During storage and in the gun positions, the shells must be protected against rain, snow and direct sun-light.

5. STACKING OF AMMUNITION

Ammunition should be stacked in the following order by shells (HE fragmentation, AP tracer).

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3. CHARGES

on	Type of shell for which it is intended	Type of powder	Approx wt. of charge without igniter Kg.	Pressure of propellant gasses Kg./per/sq/cm.	Muzzle Velocity m/per/sec
	Fragmentation-HE shell OF-412 (one piece)	NDT-3 18/1	5.5	3,000	900
	AP-Tracer shell BR-412D (with AP and ballistic caps)	NDT-3 18/1	5.5	3,000	887

NOTE:- Weights of charges quoted have been orientated; they may be altered depending on the lot and the type of powder.

4. ROUNDS

100 mm Tank guns have fixed rounds.

INDEX OF THE ELEMENTS OF ROUNDS

Index of the round	Index of the shell	Designation of the shell	Fuze
UOF-412	OF-412	Fragmentation-HE Shell (one piece) full charge	RGM-6 RGM
UBR-412D	BR-412D	AP-Tracer shell (with AP and ballistic caps)	DBR-2

NOTE:- Just as in storage, so in the firing positions the rounds ought to be sheltered from rain and snow, and also from the direct rays of the sun.

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1. Ammunition is sorted in this order: according to :-

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Shells (fragmentation - HE, AP-tracer)

Lots of charges

Lots of shells

Weight marks on the shells.

2. Charges of different lots may give differing muzzle velocities, in view of this charges for firing should all be taken from one lot.

Charges whose markings only differ in the lot number of the collection of the rounds, may be regarded as belonging to the same lot.

3. Sorting of shells is carried out, firstly according to lots, then acoording to weight marks. Shells differing on one weight mark may be included in one group.

The sorting of shells according to lots is more important than sorting shells acoording to lots and weight marks.

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SCALES:
BR/412B or BR/412D
Sight TSh2-22
"Mils" -
elevating gear.

ARMOURPIERCING - TRACER SHELL BR-412D
(with AP and ballistic caps)

Fuze DBR-2
Ranges of grazing shot : 1070 m with target height 2 m
1220 m with target height 2.7 m
1270 m with target height 3.0 m

Full charge
Muzzle velocity for
BR-412D = 887 m per sec

Range	Sight according to scale		Height of trajectory	Directional corrections		One graduation of telescopic sight alters height of impact	Angle of elevation	Angle of fall	Terminal velocity	Time of flight	Probable errors		Range
	BR/412B or BR/412D	"Mils"		for drift	for Cross-wind of 10m. per sec						vertical	lateral	
m	grad.	mil.	m	mil.	mil.	m	o 1	o	m.per sec	sec	m	m	m
200	2	1	0,1	0	0	0,1	0 05	0,1	868	0,2	0,05	0,05	200
400	4	3	0,3	0	1	0,3	0 09	0,2	849	0,4	0,1	0,1	400
600	6	4	0,5	0	1	0,4	0 14	0,2	830	0,7	0,2	0,2	600
800	8	5	1,1	0	1	0,5	0 18	0,3	811	0,9	0,2	0,2	800
1000	10	6	1,7	0	1	0,7	0 23	0,4	793	1,2	0,3	0,3	1000
200	12	8	2,6	0	1	0,9	0 28	0,5	775	1,4	0,3	0,3	200
400	14	9	3,7	0	2	1,1	0 33	0,6	757	1,7	0,4	0,4	400
600	16	11	5,0	0	2	1,3	0 39	0,7	739	2,0	0,4	0,4	600
800	18	12	6,4	0	2	1,5	0 44	0,8	722	2,2	0,5	0,5	800
2000	20	14	8,0	1	2	1,7	0 50	1,0	705	2,5	0,6	0,5	2000
200	22	16	10	1	2	1,9	0 56	1,1	588	2,8	0,6	0,6	200
400	24	17	12	1	2	2,2	1 02	1,2	571	3,1	0,7	0,6	400
600	26	19	15	1	3	2,4	1 09	1,4	554	3,4	0,7	0,7	600
800	28	21	17	1	3	2,7	1 15	1,5	638	3,7	0,8	0,7	800
3000	30	23	20	1	3	3,0	1 22	1,7	622	4,0	0,9	0,8	3000
200	32	25	24	1	3	3,3	1 29	1,9	606	4,4	1,0	0,8	200
400	34	27	28	1	3	3,7	1 36	2,1	590	4,7	1,1	0,9	400
600	36	29	32	1	3	4,0	1 44	2,3	575	5,0	1,2	0,9	600
800	38	31	36	1	4	4,4	1 52	2,6	560	5,4	1,3	1,0	800
4000	40	33	42	1	4	4,8	2 00	2,8	545	5,8	1,4	1,0	400

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TABLE OF VERTICAL INTERVALS OF TRAJECTORIES IN METRES ABOVE
THE PLANE OF THE AXIS OF THE BORE OF THE BARREL

ARMOURPIERCING - TRACER SHELL BR - 412D

Range	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	Range
200	0	-0,5	-1,6																		200
400	0,3	0	-0,8	-2,1																	400
600	0,5	0,6	0	-1,1	-2,6																600
800	0,7	1,1	0,7	0	-1,3	-3,5															800
1000	1,0	1,6	1,5	1,2	0	-1,8	-4,1														1000
1200	1,3	2,2	2,4	2,4	1,4	0	-2,1	-5,1													1200
1400	1,6	2,8	3,3	3,6	2,9	1,9	0	-2,6	-5,8												1400
1600	2,0	3,4	4,3	4,8	4,5	3,8	2,4	0	-2,8	-6,4											1600
1800	2,3	4,1	5,3	6,1	6,1	5,7	4,6	2,5	0	-3,3	-7,7										1800
2000	2,6	4,8	6,3	7,4	7,8	7,7	6,9	5,1	3,1	0	-3,9	-8,4									2000
2200	2,9	5,5	7,3	8,8	9,6	9,8	9,4	7,9	6,3	3,5	0	-4,3	-9,8								2200
2400	3,3	6,2	8,4	10	11	12	12	11	9,6	7,1	4,0	0	-5,1	-11							2400
2600	3,7	6,9	9,6	12	13	14	15	14	13	11	8,3	4,5	0	-6,5	-11						2600
2800	4,1	7,7	11	13	15	16	17	17	16	15	12	9,2	4,8	0	-5,7	-13					2800
3000	4,5	8,5	12	15	17	19	20	20	20	19	16	14	9,9	5,7	0	-6,6	-14				3000
3200	4,9	9,3	13	17	19	21	23	23	24	23	21	19	15	11	6,1	0	-7,2	-16			3200
3400	5,3	10	14	18	21	24	26	26	27	27	26	24	20	17	13	6,5	0	-8,1	-18		3400
3600	5,7	11	16	20	23	27	29	30	31	31	31	29	26	23	19	14	7,9	0	-9,0	-19	3600
3800	6,2	12	17	22	25	29	32	34	36	36	36	35	32	30	26	21	16	8,4	0	-9,7	3800
4000	6,7	13	19	24	28	32	26	38	40	41	41	41	39	37	33	29	24	17	8,9	0	4000

Scale

$\frac{GT}{T}$ sight

TSh2 - 22

"mils" -
elevation graduation

HEAVY BULLET FIRED FROM A 7.62MM TANK MACHINE GUN, 1943 MODEL

Muzzle velocity
machine gun

800 m. per sec.

Range	Sight according to scale		Height of trajectory	Correction of direction		One graduation of the telescopic sight alters height of impact	Angle of sight	Angle of impact	Terminal velocity	Time of flight	Danger space factor	Probable errors		Range
	$\frac{GT}{T}$	"Mils"		for drift	for cross-wind of 10m. per sec							height	range	
M	grad.	mil.	M	mil.	mil.	M	0 1	0	M/Sec.	Sec.		M	M	M
100	1	1	0,02	0	0,5	0,1	0 03	0,07	741	0,13	-	0,05	0,05	100
200	2	2	0,09	0	1,1	0,2	0 06	0,12	688	0,27	-	0,07	0,07	200
300	3	3	0,22	0	1,8	0,3	0 10	0,18	638	0,42	-	0,10	0,10	300
400	4	4	0,42	0	2,5	0,5	0 13	0,27	591	0,58	-	0,13	0,13	400
500	5	5	0,70	0	3,4	0,7	0 17	0,37	547	0,76	156	0,16	0,16	500
600	6	6	1,1	0	4,2	0,9	0 22	0,50	506	0,95	115	0,19	0,19	600
700	7	7	1,6	0	5,0	1,2	0 27	0,67	467	1,2	86	0,22	0,22	700
800	8	9	2,3	0,1	5,8	1,5	0 33	0,85	430	1,4	67	0,25	0,25	800
900	9	11	3,3	0,1	6,6	1,9	0 40	1,1	396	1,6	53	0,30	0,28	900
1000	10	13	4,6	0,1	7,4	2,4	0 48	1,4	366	1,9	42	0,36	0,32	1000
100	11	16	6,2	0,2	8,2	3,0	0 57	1,7	341	2,2	34	0,43	0,35	100
200	12	19	8,1	0,2	9,1	3,6	1 08	2,1	321	2,5	28	0,51	0,38	200
300	13	22	10	0,3	9,9	4,3	1 20	2,5	305	2,8	23	0,60	0,41	300
400	14	26	13	0,4	11	5,1	1 33	2,9	292	3,2	20	0,70	0,45	400
500	15	30	16	0,5	11	5,9	1 47	3,4	281	3,6	17	0,82	0,48	500
600	16	34	30	0,6	12	6,8	2 02	3,9	271	3,9	15	0,95	0,51	600
700	17	38	24	0,6	13	7,8	2 18	4,4	262	4,3	13	1,1	0,55	700
800	18	43	29	0,7	14	8,8	2 35	5,0	253	4,7	11	1,2	0,58	800
900	19	48	35	0,8	15	9,9	2 52	5,7	245	5,1	10	1,4	0,61	900
2000	20	53	42	0,9	16	11	3 10	6,4	238	5,5	9	1,5	0,64	2000
100	21	58	49	1,1	16	12	3 30	7,1	231	6,0	8	1,7	0,67	100
200	22	64	57	1,2	17	14	3 52	7,9	224	6,4	7	1,9	0,71	200

The danger space is the product of the height of sight by the coefficient "K"

TABLE OF VERTICAL INTERVALS OF TRAJECTORIES ABOVE THE LINE OF SIGHT OF TELESCOPIC SIGHTS WHEN FIRING A HEAVY BULLET FROM A 7.62MM TANK MACHINE GUN, 1943 MODEL.

Muzzle velocity of machine gun - 800 m. per sec.

Range M / Sight	50	100	150	200	250	300	350	400	450
			CENTIMETRES						
1	4	0	-9						
2	9	11	7	0	-12				
3	15	20	23	21	14	0	-20		
4	20	32	41	43	41	34	21	0	-27

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	
					MEMP 61													
5	0,4	0,7	0,7	0,5	0	-0,7												5
6	0,6	1,0	1,2	0,9	0,7	0	-1,0	-2,6										6
7	0,8	1,4	1,6	1,6	1,4	0,9	0	-1,5	-3,6									7
8	1,0	1,7	2,1	2,4	2,4	2,0	1,3	0	-2,0	-4,4								8
9	1,2	2,1	2,8	3,2	3,4	3,2	2,7	1,6	0	-2,4	-5,3							9
10	1,4	2,6	3,5	4,2	4,6	4,5	4,3	3,4	2,0	0	-2,9	-6,5						10
11	1,7	3,1	4,3	5,3	5,8	6,0	6,1	5,5	4,4	2,6	0	-3,5	-8,0					11
12	2,0	3,7	5,2	6,5	7,4	7,8	8,1	7,9	7,0	5,7	3,2	0	-4,3	-9,6				12
13	2,3	4,4	6,2	7,8	9,1	9,8	10	9,8	10	8,9	6,6	3,9	0	-5,0	-11			13
14	2,6	5,1	7,3	9,2	11	12	13	12	13	12	11	8,2	4,6	0	-5,8	-13		14
15	3,0	5,9	8,4	11	13	15	16	15	17	16	15	13	9,8	5,4	0	6,7	-15	15

IU. FIRING TABLES OF THE

50X1-HUM

FRAGMENTATION-HE SHELL

OF - 412

(One-piece)

50X1-HUM

IU. FIRING TABLES OF THE 50X1-HUM

FRAGMENTATION-HE SHELL OF-412

(one-piece)

Fuzes; RGM and RGM-6

Charge; FULL

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SECRET

Scale
Frag.-HE
Full
TSh2-22 sight
"Mils" -
elevation graduation

FRAGMENTATION - HE SHELL OF-412 (one-piece).

Fuzes [illegible] RGM, RGM-6
Ranges of direct fire: 1100m at a target height of 2m.
1260m at a target height of 2.7m.
1320m at a target height of 3m.

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Frag.-HE
Full
Full charge
Muzzle velocity
900m per sec.

Range	Sight according to scale: Frag. HE Full	Sight according to scale: "mils"	Height of trajectory	Corrections: to direction: for drift	Corrections: to direction: for cross-wind of speed 10m per sec	Corrections: to range: for differences of: head-wind of speed 10m per sec	Corrections: to range: for differences of: air pressure by 10mm	Corrections: to range: for differences of: air temp. by 10°	Corrections: to range: for differences of: muzzle velocity by 1%	Corrections: to range: for differences of: Charge temp. by 10°	Corrections: to range: for differences of: weights of shell by one mark	alteration of range by alteration of angle of elevation by 1 mil	narrow bracket	Angle of elevation	Angle of Impact	Terminal velocity	Time of flight	Probable errors: Range	Probable errors: height	Probable errors: side	Range
M	grad.	mil	M	mil	mil	M	M	M	M	M	M	M	mil	0 1	0	M/Sec	Sec	M	M	M	M
200	2	1	0,1	0	0	1	0	1	4	5	+ 1	167	1	0 04	0,1	885	0,2	33	0,0	0,0	200
400	4	2	0,3	0	0	1	0	1	8	10	+ 2	163	1	0 09	0,1	870	0,5	33	0,0	0,0	400
600	6	4	0,6	0	0	1	0	2	11	15	+ 2	159	1	0 13	0,2	855	0,7	32	0,1	0,1	600
800	8	5	1,0	0	0	1	0	2	15	21	+ 3	155	1	0 18	0,3	840	0,9	31	0,2	0,1	800
1000	10	6	1,6	0	1	2	1	3	19	27	+ 3	151	1	0 22	0,4	825	1,1	30	0,2	0,2	1000
200	12	8	2,4	0	1	2	1	4	22	31	+ 4	148	1	0 27	0,5	811	1,3	30	0,2	0,2	200
400	14	9	3,4	0	1	3	1	4	26	36	+ 4	144	1	0 32	0,6	796	1,6	29	0,3	0,2	400
600	16	10	4,5	0	1	3	2	5	29	41	+ 5	141	1	0 37	0,7	782	1,8	29	0,3	0,3	600
800	18	12	5,8	0	1	4	2	6	33	46	+ 5	138	1	0 42	0,8	768	2,1	28	0,3	0,3	800
2000	20	13	7,2	0	1	5	3	7	36	50	+ 6	135	1	0 47	0,9	754	2,4	28	0,4	0,4	2000
200	22	14	8,8	0	1	5	3	8	39	55	+ 6	132	1	0 52	1,0	741	2,6	27	0,4	0,5	200
400	24	16	11	0	1	6	4	9	43	60	+ 6	129	1	0 58	1,1	727	2,9	27	0,5	0,6	400
600	26	18	13	0	1	6	5	10	46	64	+ 6	126	1	1 03	1,2	714	3,2	26	0,5	0,7	600
800	28	19	16	0	1	7	6	11	49	69	+ 6	122	1	1 09	1,3	700	3,5	25	0,5	0,8	800
3000	30	21	18	0	2	8	6	13	52	73	+ 7	119	1	1 15	1,5	686	3,8	25	0,6	0,9	3000
200	32	22	21	0	2	9	7	15	55	77	+ 7	115	1	1 21	1,6	673	4,1	24	0,6	0,9	200
400	33	24	24	0	2	11	8	17	58	81	+ 7	112	1	1 27	1,8	660	4,4	24	0,7	1,0	400
600	35	26	27	0	2	12	9	19	60	84	+ 7	109	1	1 34	1,9	647	4,7	24	0,8	1,0	600
800	37	28	31	1	2	13	10	21	63	88	+ 7	107	1	1 40	2,1	634	5,0	24	0,8	1,1	800
4000	39	30	35	1	2	15	12	24	66	92	+ 7	104	1	1 47	2,2	621	5,4	23	0,9	1,2	4000
200	41	32	39	1	2	16	13	26	69	96	+ 7	102	1	1 54	2,4	608	5,7	23	0,9	1,2	200
400	43	34	44	1	2	18	14	28	71	100	+ 7	100	1	2 02	2,6	595	6,0	23	1,0	1,3	400
600	45	36	49	1	2	20	16	31	74	104	+ 6	97	1	2 09	2,8	583	6,3	23	1,1	1,4	600
800	46	38	55	1	3	22	17	34	76	107	+ 6	95	1	2 17	3,1	571	6,6	23	1,2	1,4	800
5000	48	40	61	1	3	23	18	37	79	110	+ 6	92	1	2 25	3,3	560	7,0	22	1,3	1,5	5000
200	50	42	67	1	3	25	20	40	81	113	+ 6	89	1	2 33	3,5	548	7,3	22	1,3	1,5	200
400	52	45	74	1	3	27	21	43	83	116	+ 6	86	1	2 41	3,8	536	7,7	22	1,4	1,6	400
600	54	47	81	1	3	29	23	46	85	119	+ 5	84	1	2 50	4,0	524	8,1	22	1,5	1,6	600
800	56	50	89	1	3	31	25	49	88	123	+ 5	81	1	2 59	4,2	512	8,5	22	1,6	1,7	800

SECRET

50X1-HUM

Scale:
Frag-H.E.(OF)
FULL
TSH2-22 sight
"mils"
elevation graduations

Frag-H.E.
FULL
Full charge.
50X1-HUM

RANGE	Sight according to scale: OF FULL	Sight according to scale: "mils"	Height of trajectory	Corrections: to direction: for drift	Corrections: to direction: for crosswind of speed 10 m. per. sec	Corrections: to range: headwind of speed 10 m. per. sec.	Corrections: to range: for differences of: Air pressure by 10 mm	Corrections: to range: for differences of: air temperature by 10°	Corrections: to range: for differences of: Muzzle velocity by 1%	Corrections: to range: for differences of: Charge Temperature by 10°	Corrections: to range: for differences of: Weight of shell by one mark	Alteration of range by alteration of angle of elevation by 1 mil	narrow bracket	Angle of elevation	Angle of impact	Terminal velocity	Time of flight	Probable errors: RANGE	Probable errors: HEIGHT	Probable errors: SIDE	RANGE
M	Grad.	mil	M	mil	mil	M	M	M	M	M	M	M	mil	o '	o	m/sec	sec	M	M	M	M
6000	58	52	97	1	4	34	26	52	90	126	+4	79	1	3 08	4,5	501	8,9	22	1,7	1,8	6000
200	59	55	106	1	4	36	28	55	92	129	+4	75	1	3 17	4,8	489	9,3	22	1,8	1,8	200
400	61	58	116	1	4	39	30	59	94	132	+3	74	1	3 27	5,1	478	9,7	22	2,0	1,9	400
600	63	60	126	1	4	42	32	63	96	135	+3	71	1	3 37	5,4	467	10	22	2,1	1,9	600
800	66	63	137	1	4	45	33	66	98	138	+2	69	1	3 48	5,8	457	10	22	2,3	2,0	800
7000	68	66	149	1	4	48	35	70	100	140	+2	66	1	3 59	6,2	447	11	22	2,4	2,1	7000
200		69	162	2	4	52	37	73	102	143	+1	64	2	4 10	6,5	437	12	22	2,6	2,1	200
400		72	175	2	5	55	39	77	103	145	+1	61	2	4 21	6,9	427	12	22	2,8	2,2	400
600		76	189	2	5	58	40	80	105	147	0	59	2	4 33	7,3	418	12	22	2,9	2,3	600
800		79	204	2	5	62	42	84	106	149	-1	57	2	4 45	7,8	409	13	22	3,0	2,4	800
8000		82	220	2	5	65	44	88	108	151	-1	55	2	4 57	8,3	401	13	22	3,2	2,5	8000
200		86	237	2	6	69	46	92	109	153	-2	53	2	5 09	8,8	394	14	22	3,4	2,5	200
400		89	255	2	6	73	48	96	111	155	-2	52	2	5 22	9,3	387	14	22	3,6	2,6	400
600		93	274	2	6	78	50	100	112	157	-3	50	2	5 35	9,8	380	15	22	3,8	2,6	600
800		97	295	2	6	82	53	105	114	159	-4	48	2	5 49	10	373	15	22	4,1	2,7	800
9000		101	317	2	6	87	55	110	115	161	-5	46	2	5 04	11	367	16	23	4,4	2,7	9000
200		105	340	2	7	92	57	114	116	163	-5	44	2	6 20	12	361	17	23	4,7	2,8	200
400		110	365	3	7	97	60	119	118	165	-7	42	2	6 36	12	355	17	24	5,1	2,8	400
600		115	392	3	7	102	62	124	119	167	-8	41	2	6 53	13	350	18	24	5,5	2,9	600
800		120	421	3	7	107	64	129	120	168	-9	40	2	7 11	14	345	18	24	6,0	3,0	800
10000		125	452	3	8	113	66	134	121	170	-10	38	3	7 30	14	340	19	25	6,4	3,1	10000
200		130	485	3	8	118	69	139	123	172	-11	37	3	7 49	15	335	20	25	6,9	3,2	200
400		136	520	3	8	124	71	144	124	173	-12	35	3	8 09	16	330	20	26	7,4	3,3	400
600		141	551	4	8	130	73	149	125	175	-12	35	3	8 29	17	326	21	26	7,9	3,3	600
800		147	599	4	8	136	75	154	127	177	-13	34	3	8 50	18	322	22	26	8,4	3,4	800
11000		153	635	4	9	142	78	159	128	179	-14	33	3	9 11	18	318	22	27	9,0	3,5	11000
200		159	676	4	9	148	80	164	129	181	-15	32	4	9 32	19	315	23	27	9,6	3,6	200
400		165	719	4	9	154	82	169	131	183	-16	32	4	9 54	20	312	24	28	10	3,7	400
600		171	764	4	9	160	84	174	132	185	-16	31	4	10 16	21	309	24	28	11	3,8	600
800		177	811	5	10	167	86	179	133	186	-17	31	4	10 39	22	307	25	28	11	3,8	800

50X1-HUM

SECRET

Scale
Frag-H.E. (OF)
FULL
T5h2-22 sight
"mils -
elevation graduations

RANGE	Sight According to scale		Height of trajectory	Corrections									Alteration of range by alteration of angle of elevation by 1 mil.	narrow bracket	Angle of elevation	Angle of impact	Terminal velocity	Time of flight	Probable errors			RANGE
				to direction		to range																
						headwind of speed 10.m. per sec.	for differences of															
	OF FULL	"mils"		for drift	for crosswind of speed 10 m. per. sec.		air pressure by 10 mm	air temperature by 10°	Muzzle velocity by 1%	Charge temperature by 10°	Weight of shell by one mark							RANGE	HEIGHT	SIDE	
M	Grad	mil	M	mil	mil	M	M	M	M	M	M	M	M	mil	° '	°	m/sec	sec	M	M	M	M
12000		184	860	5	10	173	88	184	134	188	-18	30	4	11 02	23	305	26	29	12	3.9	12000
200		180	911	5	10	180	90	189	136	190	-19	30	4	11 26	24	303	27	29	13	4.0	200
400		197	964	5	10	187	91	194	137	192	-19	29	4	11 50	25	302	27	30	14	4.1	400
600		207	1020	5	10	194	95	199	138	193	-20	29	4	12 15	25	301	28	30	15	4.2	600
800		211	1080	5	11	201	95	204	139	195	-21	28	5	12 40	26	300	29	30	15	4.3	800
13000		218	1140	5	11	208	97	208	141	197	-21	27	5	13 06	27	299	30	31	16	4.4	13000
200		225	1200	5	11	216	98	213	142	199	-22	27	5	13 32	28	299	30	31	17	4.5	200
400		233	1260	6	11	223	100	218	143	201	-22	27	5	13 59	29	299	31	31	17	4.6	400
600		240	1330	6	11	231	102	223	145	203	-23	26	5	14 26	29	299	32	32	18	4.8	600
800		248	1400	6	12	238	104	228	146	204	-24	25	5	14 54	30	298	33	32	19	4.9	800
14000		256	1470	6	12	246	106	233	147	206	-25	25	5	15 23	31	298	34	33	20	4.9	14000
200		264	1540	6	12	254	107	238	148	207	-25	24	6	15 52	32	299	34	33	21	5.0	200
400		273	1620	7	12	262	109	242	149	208	-26	23	6	16 22	33	299	35	33	22	5.1	400
600		281	1700	7	12	270	111	247	150	210	-27	22	6	16 53	34	299	36	34	23	5.3	600
800		290	1780	7	12	278	112	252	151	212	-27	22	6	17 25	34	299	37	34	24	5.5	800
15000		299	1870	7	13	287	114	256	152	214	-28	22	6	17 57	35	299	37	35	25	5.9	15000
200		308	1960	8	13	295	116	261	154	216	-28	22	7	18 30	36	300	38	35	26	5.9	200
400		317	2050	8	13	303	118	265	155	217	-29	21	7	19 03	37	300	39	35	27	5.9	400
600		327	2150	8	13	312	120	270	156	218	-30	21	8	19 37	38	301	40	36	28	6.0	600
800		337	2250	9	13	320	122	275	158	220	-30	20	8	20 12	39	301	41	36	29	6.1	800
16000		347	2350	9	14	329	123	279	159	222	-31	19	8	20 48	39	302	42	37	30	6.2	16000
200		357	2450	9	14	338	125	284	161	224	-31	19	8	21 25	40	302	43	37	31	6.4	200
400		367	2560	9	14	347	127	288	162	226	-32	19	8	22 02	41	303	44	37	33	6.6	400
600		378	2670	10	14	356	129	293	163	228	-33	18	9	22 40	42	303	45	38	34	6.7	600
800		389	2790	10	14	365	131	297	165	230	-34	18	9	23 19	43	304	46	38	36	6.9	800

SECRET

FRAGMENTATION-H.E. SHELL
OF -412
(ONE-PIECE)

TABLE OF CORRECTIONS OF THE ANGLE OF ELEVATION
BY THE ANGLE OF SIGHT

FULL
FULL CHARGE

50X1-HUM

A. CORRECTIONS WHEN THE TARGET IS HIGHER THAN TANK

Angles of elevation / Angles of sight	100	140	180	220	260	300	320	340	360	380	
10	0	0	0	0	0	0	0	0	0	1	10
20	0	0	0	0	0	0	0	1	1	1	20
30	0	0	0	0	0	1	1	1	1	2	30
40	0	1	1	1	1	1	1	1	2	3	40
50	1	1	1	1	1	1	1	2	3	4	50
60	1	1	1	1	1	1	2	3	4	5	60

Notes: 1. Corrections of the angle of elevation are positive.

2. Angles of sight, angles of elevation, and corrections are in mils.

120	1	1	1	2	3	5	6	7	9	10	120
130	1	1	1	2	3	5	7	8	10	12	130

CORRECTIONS WHEN THE TARGET IS LOWER THAN THE TANK

	100	140	180	220	260	300	320	340	360	380	
10	0	0	0	0	+ 1	0	0	0	0	0	10
20	0	0	0	0	+ 1	0	0	0	0	0	20
30	1	0	0	0	+ 1	+ 1	0	0	0	0	30
40	1	1	0	0	+ 1	+ 2	+ 1	0	0	0	40
50	1	1	0	0	+ 1	+ 2	+ 1	0	0	0	50
60	1	1	1	+ 1	+ 2	+ 2	+ 1	+ 1	0	0	60
70	1	1	1	+ 1	+ 3	+ 2	+ 1	+ 1	+ 1	0	70

Notes: 1. Corrections of the angle of elevation are negative without a sign and positive with a sign (+).

2. Angles of sight, angles of elevation, and corrections are in mils.

120	2	3	4	2	+ 3	+ 4	+ 3	+ 3	+ 2	+ 1	120
130	3	3	4	3	+ 2	+ 4	+ 4	+ 4	+ 4	+ 2	130

50X1-HUM

SECRET

U. AUXILIARY TABLES

50X1-HUM

50X1-HUM

U. AUXILIARY TABLES.

50X1-HUM

1. TABLES OF TANGENTS OF ANGLES.

2. TABLES OF CONVERSION OF GRADUATIONS OF THE PROTRACTOR INTO DEGREES AND MINUTES.

3. TABLE OF SINES OF ANGLES.

4. TABLE FOR THE RESOLUTION OF BALLISTIC WIND INTO CONSTITUENTS.

50X1-HUM

TABLES OF TANGENTS OF ANGLES

TABLE A

FROM 0 TO 10° BY "10 MINUTES"

Degrees / Minutes	0	1	2	3	4	5	6	7	8	9	Degrees / Minutes
00	0,000	0,017	0,035	0,052	0,070	0,087	0,105	0,123	0,141	0,158	00
10	0,003	0,020	0,038	0,055	0,073	0,090	0,108	0,126	0,144	0,161	10
20	0,006	0,023	0,041	0,058	0,076	0,093	0,111	0,129	0,146	0,164	20
30	0,009	0,026	0,044	0,061	0,079	0,096	0,114	0,132	0,149	0,167	30
40	0,012	0,029	0,047	0,064	0,082	0,099	0,117	0,135	0,152	0,170	40
50	0,015	0,032	0,049	0,067	0,085	0,102	0,120	0,138	0,155	0,173	50
60	0,017	0,035	0,052	0,070	0,087	0,105	0,123	0,141	0,158	0,176	60

TABLE B

FROM 10 TO 90° BY "1°"

Degrees	10	20	30	40	50	60	70	80	Degrees
0	0,176	0,364	0,577	0,839	1,19	1,73	2,75	5,67	0
1	0,194	0,384	0,601	0,869	1,23	1,80	2,90	6,31	1
2	0,213	0,404	0,625	0,900	1,28	1,88	3,08	7,12	2
3	0,231	0,424	0,649	0,933	1,33	1,96	3,27	8,14	3
4	0,249	0,445	0,675	0,966	1,38	2,05	3,49	9,51	4
5	0,268	0,466	0,700	1,00	1,43	2,14	3,73	11,4	5
6	0,287	0,488	0,727	1,04	1,48	2,25	4,01	14,3	6
7	0,306	0,510	0,754	1,07	1,54	2,36	4,33	19,1	7
8	0,325	0,532	0,781	1,11	1,60	2,48	4,70	28,6	8
9	0,347	0,554	0,810	1,15	1,66	2,61	5,14	57,3	9
10	0,367	0,577	0,839	1,19	1,73	2,75	5,67	-	10

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TABLE A.

PROTRACTOR DIVISIONS	0-00	1-00	2-00	3-00	4-0	5-00	6-00	7-00	8-00	9-00	PROTRACTOR DIVISIONS
					DEGREES						
00-00	00	6	12	18	24	30	36	42	48	54	00-00
10-00	60	66	72	78	84	90	96	102	108	114	10-00
20-00	120	126	132	138	144	150	156	162	168	174	20-00
30-00	180	186	192	198	204	210	216	222	228	234	30-00
40-00	240	246	252	258	264	270	276	282	288	294	40-00
50-00	300	306	312	318	324	330	336	342	348	354	50-00

TABLE B. in Degrees and Minutes

PROTRACTOR DIVISIONS	0-00	0-01	0-02	0-03	0-04	0-05	0-06	0-07	0-08	0-09	PROTRACTOR DIVISIONS
0-00	0 00	0 04	0 07	0 11	0 14	0 18	0 22	0 25	0 29	0 32	0-00
0-10	0 36	0 40	0 43	0 47	0 50	0 54	0 58	1 01	1 05	1 08	0-10
0-20	1 12	1 16	1 19	1 23	1 26	1 30	1 34	1 37	1 41	1 44	0-20
0-30	1 48	1 52	1 55	1 59	2 02	2 06	2 10	2 13	2 17	2 20	0-30
0-40	2 24	2 28	2 31	2 35	2 38	2 42	2 46	2 49	2 53	2 56	0-40
0-50	3 00	3 04	3 07	3 11	3 14	3 18	3 22	3 25	3 29	3 32	0-50
0-60	3 36	3 40	3 43	3 47	3 50	3 54	3 58	4 01	4 05	4 08	0-60
0-70	4 12	4 16	4 19	4 23	4 26	4 30	4 34	4 37	4 41	4 44	0-70
0-80	4 48	4 52	4 55	4 59	5 02	5 06	5 10	5 13	5 17	5 20	0-80
0-90	5 24	5 28	5 31	5 35	5 38	5 42	5 46	5 49	5 53	5 56	0-90

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50X1-HUM

TABLE OF SINES OF ANGLES
(Angles in protractor divisions by 0-10)

Protractor divisions	0	1-00	2-00	3-00	4-00	5-00	6-00	7-00	8-00	9-00	10-00	11-00	12-00	13-00	14-00	Protractor divisions
0-00	0	0,105	0,208	0,309	0,407	0,500	0,588	0,669	0,743	0,809	0,866	0,914	0,951	0,978	0,994	00-00
0-10	0,010	0,115	0,218	0,319	0,416	0,509	0,596	0,677	0,750	0,815	0,871	0,918	0,954	0,980	0,995	0,10
0-20	0,021	0,125	0,228	0,329	0,426	0,518	0,605	0,685	0,757	0,821	0,876	0,922	0,957	0,982	0,996	0-20
0-30	0,031	0,136	0,239	0,339	0,435	0,527	0,613	0,692	0,764	0,827	0,881	0,926	0,960	0,984	0,997	0-30
0-40	0,042	0,146	0,249	0,349	0,445	0,536	0,621	0,700	0,771	0,833	0,886	0,930	0,963	0,986	0,998	0-40
0-50	0,052	0,156	0,259	0,358	0,454	0,545	0,629	0,707	0,777	0,839	0,891	0,934	0,966	0,988	0,999	0-50
0-60	0,063	0,167	0,269	0,368	0,463	0,553	0,637	0,714	0,784	0,844	0,896	0,937	0,969	0,989	0,999	0-60
0-70	0,073	0,177	0,279	0,378	0,473	0,562	0,645	0,722	0,790	0,850	0,900	0,941	0,971	0,991	1,000	0-70
0-80	0,084	0,187	0,289	0,388	0,482	0,571	0,653	0,729	0,797	0,855	0,905	0,944	0,974	0,992	1,000	0-80
0-90	0,094	0,198	0,299	0,397	0,491	0,579	0,661	0,736	0,803	0,861	0,909	0,948	0,976	0,993	1,000	0-90

SECRET

50X1-HUM

Table for the analysis of ballistic wind into constituents

Wind direction directional angle of target minus directional angle of wind wind changes range direction.				Wind speed in metres per sec.																			
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Correction marks + −	Correction marks − −	Correction marks − +	Correction marks + +	Numerator - longitudinal Denominator - latitudinal										Constituent in metres per sec Constituent in metres per sec								
0	30	30	60	$\frac{1}{0}$	$\frac{2}{0}$	$\frac{3}{0}$	$\frac{4}{0}$	$\frac{5}{0}$	$\frac{6}{0}$	$\frac{7}{0}$	$\frac{8}{0}$	$\frac{9}{0}$	$\frac{10}{0}$	$\frac{11}{0}$	$\frac{12}{0}$	$\frac{13}{0}$	$\frac{14}{0}$	$\frac{15}{0}$	$\frac{16}{0}$	$\frac{17}{0}$	$\frac{18}{0}$	$\frac{19}{0}$	$\frac{20}{0}$
1	29	31	59	$\frac{1}{0}$	$\frac{2}{0}$	$\frac{3}{0}$	$\frac{4}{0}$	$\frac{5}{1}$	$\frac{6}{1}$	$\frac{7}{1}$	$\frac{8}{1}$	$\frac{9}{1}$	$\frac{10}{1}$	$\frac{11}{1}$	$\frac{12}{1}$	$\frac{13}{1}$	$\frac{14}{1}$	$\frac{15}{2}$	$\frac{16}{2}$	$\frac{17}{2}$	$\frac{18}{2}$	$\frac{19}{2}$	$\frac{20}{2}$
2	28	32	58	$\frac{1}{0}$	$\frac{2}{0}$	$\frac{3}{1}$	$\frac{4}{1}$	$\frac{5}{1}$	$\frac{6}{1}$	$\frac{7}{1}$	$\frac{8}{2}$	$\frac{9}{2}$	$\frac{10}{2}$	$\frac{11}{2}$	$\frac{11.5}{2}$	$\frac{12.5}{3}$	$\frac{13.5}{3}$	$\frac{14.5}{3}$	$\frac{15.5}{3}$	$\frac{16.5}{4}$	$\frac{17.5}{4}$	$\frac{18.5}{4}$	$\frac{19.5}{4}$
3	27	33	57	$\frac{1}{0}$	$\frac{2}{1}$	$\frac{3}{1}$	$\frac{4}{1}$	$\frac{5}{2}$	$\frac{5.5}{2}$	$\frac{6.5}{2}$	$\frac{7.5}{2}$	$\frac{8.5}{3}$	$\frac{9.5}{3}$	$\frac{10.5}{3}$	$\frac{11.5}{4}$	$\frac{12.5}{4}$	$\frac{13.5}{4}$	$\frac{14.5}{5}$	$\frac{15}{5}$	$\frac{16}{5}$	$\frac{17}{6}$ 6	$\frac{18}{6}$	$\frac{19}{6}$
4	26	34	56	$\frac{1}{0}$	$\frac{2}{1}$	$\frac{2.5}{1}$	$\frac{3.5}{2}$	$\frac{4.5}{2}$	$\frac{5.5}{2}$	$\frac{6.5}{3}$	$\frac{7.5}{3}$	$\frac{8}{4}$	$\frac{9}{4}$	$\frac{10}{4}$	$\frac{11}{5}$	$\frac{12}{5}$	$\frac{13}{6}$	$\frac{13.5}{6}$	$\frac{14.5}{7}$	$\frac{15.5}{7}$	$\frac{16.5}{7}$	$\frac{17.5}{8}$	$\frac{18.5}{8}$
5	25	35	55	$\frac{1}{0}$	$\frac{1.5}{1}$	$\frac{2.5}{2}$	$\frac{3.5}{2}$	$\frac{4.5}{2}$	$\frac{5}{3}$	$\frac{6}{4}$	$\frac{7}{4}$	$\frac{8}{4}$	$\frac{8.5}{5}$	$\frac{9.5}{6}$	$\frac{10.5}{6}$	$\frac{11.5}{5}$	$\frac{12}{7}$	$\frac{13}{8}$	$\frac{14}{8}$	$\frac{14.5}{8}$	$\frac{15.5}{9}$	$\frac{16.5}{9}$	$\frac{17.5}{10}$
6	24	36	54	$\frac{1}{1}$	$\frac{1.5}{1}$	$\frac{2.5}{2}$	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{5.5}{4}$	$\frac{6.5}{5}$	$\frac{7.5}{5}$	$\frac{8}{6}$	$\frac{9}{6}$	$\frac{9.5}{7}$	$\frac{10.5}{8}$	$\frac{11.5}{8}$	$\frac{12}{9}$	$\frac{13}{9}$	$\frac{14}{10}$	$\frac{14.5}{11}$	$\frac{15.5}{11}$	$\frac{16}{12}$
7	23	37	53	$\frac{1.5}{1}$	$\frac{1.5}{1}$	$\frac{2}{2}$	$\frac{3}{3}$	$\frac{3.5}{3}$	$\frac{4.5}{4}$	$\frac{5}{5}$	$\frac{6}{5}$	$\frac{6.5}{6}$	$\frac{7.5}{7}$	$\frac{8}{7}$	$\frac{9}{8}$	$\frac{9.5}{9}$	$\frac{10.5}{9}$	$\frac{11}{10}$	$\frac{12}{11}$	$\frac{12.5}{11}$	$\frac{13.5}{12}$	$\frac{14}{13}$	$\frac{15}{13}$

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WIND SPEED IN METRES PER SEC

Wind direction Directional angle of target minus directional angle of wind Wind alters range/direction				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
+	−	∓	±	50X1-HUM Numerator - Longitudinal constituent in metres per sec Donominator - Latitudinal constituent in metres per sec																			
8	22	38	52	$\frac{0,5}{1}$	$\frac{1,5}{1}$	$\frac{2}{2}$	$\frac{2,5}{3}$	$\frac{3,5}{4}$	$\frac{4}{4}$	$\frac{4,5}{5}$	$\frac{5,5}{6}$	$\frac{6}{7}$	$\frac{6,5}{7}$	$\frac{7,5}{8}$	$\frac{8}{9}$	$\frac{8,5}{10}$	$\frac{9,5}{10}$	$\frac{10}{11}$	$\frac{10,5}{12}$	$\frac{11,5}{13}$	$\frac{12}{13}$	$\frac{12,5}{14}$	?
9	21	39	51	$\frac{0,5}{1}$	$\frac{1}{2}$	$\frac{2}{2}$	$\frac{2,5}{3}$	$\frac{3}{4}$	$\frac{3,5}{5}$	$\frac{4}{6}$	$\frac{4,5}{6}$	$\frac{5,5}{7}$	$\frac{6}{8}$	$\frac{6,5}{9}$	$\frac{7}{10}$	$\frac{7,5}{11}$	$\frac{8}{11}$	$\frac{9}{12}$	$\frac{9,5}{13}$	$\frac{10}{14}$	$\frac{10,5}{15}$	$\frac{11}{15}$	?
10	20	40	50	$\frac{0,5}{1}$	$\frac{1}{2}$	$\frac{1,5}{3}$	$\frac{2}{3}$	$\frac{2,5}{4}$	$\frac{3}{5}$	$\frac{3,5}{6}$	$\frac{4}{7}$	$\frac{4,5}{8}$	$\frac{5}{9}$	$\frac{5,5}{10}$	$\frac{6}{10}$	$\frac{6,5}{11}$	$\frac{7}{12}$	$\frac{7,5}{13}$	$\frac{8}{14}$	$\frac{8,5}{15}$	$\frac{9}{16}$	$\frac{9,5}{16}$	?
11	19	41	49	$\frac{0,5}{1}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1,5}{4}$	$\frac{2}{5}$	$\frac{2,5}{5}$	$\frac{3}{6}$	$\frac{3,5}{7}$	$\frac{3,5}{8}$	$\frac{4}{9}$	$\frac{4,5}{10}$	$\frac{5}{11}$	$\frac{5,5}{12}$	$\frac{5,5}{13}$	$\frac{6}{14}$	$\frac{6,5}{15}$	$\frac{7}{16}$	$\frac{7,5}{16}$	$\frac{7,5}{17}$	?
12	18	42	48	$\frac{0,5}{1}$	$\frac{0,5}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1,5}{5}$	$\frac{2}{6}$	$\frac{2}{7}$	$\frac{2,5}{8}$	$\frac{3}{9}$	$\frac{3}{10}$	$\frac{3,5}{10}$	$\frac{3,5}{11}$	$\frac{4}{12}$	$\frac{4,5}{13}$	$\frac{4,5}{14}$	$\frac{5}{15}$	$\frac{5,5}{16}$	$\frac{5,5}{17}$	$\frac{6}{18}$	?
13	17	43	47	$\frac{0}{1}$	$\frac{0,5}{2}$	$\frac{0,5}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1,5}{7}$	$\frac{1,5}{8}$	$\frac{2}{9}$	$\frac{2}{10}$	$\frac{2,5}{11}$	$\frac{2,5}{12}$	$\frac{2,5}{13}$	$\frac{3}{14}$	$\frac{3}{15}$	$\frac{3,5}{16}$	$\frac{3,5}{17}$	$\frac{3,5}{18}$	$\frac{4}{19}$	?
14	16	44	46	$\frac{0}{1}$	$\frac{0}{2}$	$\frac{0,5}{3}$	$\frac{0,5}{4}$	$\frac{0,5}{5}$	$\frac{0,5}{6}$	$\frac{0,5}{7}$	$\frac{1}{8}$	$\frac{1}{9}$	$\frac{1}{10}$	$\frac{1}{11}$	$\frac{1,5}{12}$	$\frac{1,5}{13}$	$\frac{1,5}{14}$	$\frac{1,5}{15}$	$\frac{1,5}{16}$	$\frac{2}{17}$	$\frac{2}{18}$	$\frac{2}{19}$	?
15	15	45	45	$\frac{0}{1}$	$\frac{0}{2}$	$\frac{0}{3}$	$\frac{0}{4}$	$\frac{0}{5}$	$\frac{0}{6}$	$\frac{0}{7}$	$\frac{0}{8}$	$\frac{0}{9}$	$\frac{0}{10}$	$\frac{0}{11}$	$\frac{0}{12}$	$\frac{0}{13}$	$\frac{0}{14}$	$\frac{0}{15}$	$\frac{0}{16}$	$\frac{0}{17}$	$\frac{0}{18}$	$\frac{0}{19}$	?

Plus (+) means that in calculating the corrections to the wind the range (angle measurement) increases in consequence

Minus (−) means that the range (angle measurement) decreases in consequence

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(34) A. DETERMINATION OF FIRING CONDITIONS

1. Determination of the change in muzzle velocity caused by wear of the bore of the barrel.

2. Determination of meteorological conditions.

3. Determination of the correction for the charge.

(35) 1. DETERMINATION OF THE CHANGE IN MUZZLE VELOCITY CAUSED BY WEAR OF THE BORE OF THE BARREL

The determination of the change in muzzle velocity caused by wear of the bore of the barrel is derived according to the dependence of the change on the lengthening of the charge chamber shewn below (dependence on).

For determination of the lengthening of the charge chamber with a given state of the bore of the barrel measure the length of the chamber, and from the size obtained read the length of the charge chamber for a new barrel (shewn in the manual of the barrel).

Measuring the length of the charge chamber is done with the PZK instrument with a measuring ring of 103.19mm diameter, with the employment for measuring of a guiding disc of 139.8mm diameter.

If there is nothing shewn in the manual of the barrel concerning the length of the charge chamber for a new barrel measured with the PZK instrument then this initial length is accepted as equal to 721mm.

Dependence on

For full charge

Lengthening of charge chamber mm	2	6	13	25	56	176	290	408	492	570
Change in muzzle velocity %	-0.5	-1	-1.5	-2	-2.5	-3	23.5+	-4	-4.5	-5

2. DETERMINATION OF METEOROLOGICAL CONDITIONS

Meteorological conditions are determined from the AMS bulletin "Meteo-ognevoi" (= "Meteor-fire") broadcast in the form of the following telephone message (example):

"Meteo-ognevoi" 170805-0084-51567-02-695204-04-685304-08-675507-12-695910 &c.

(36) The meanings of the figures are determined by their place in each group and the position of the group in the telephone message:-

1st group (6 figs) 170805 - day of the month (17) = 17th;
- hour of observation (08) = 8 a.m.
- minutes of observation (05) = 5 minutes

2nd group (4 figs) 0084 - height of AMS above sea level (0084) = 84m

+ Original reads "23.5", although probably "-3.5" is correct

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3rd group (5 figs) = ground variation of atmospheric pressure (515) = -15mm;
51567 = ground [redacted]
(67) = 170

4th group (2 figs) = height of trajectory in 100s of metres (02) = 200m

5th group (6 figs) = ballistic variation of air temperature for this trajectory (69) = -19°;
= bearing of the ballistic winds for the same trajectory (52) = 52-00;
= ballistic wind speed (04) = 4 m/sec

All following 2-figure groups of figures shew the height of the trajectory in 100s of metres, as in the 4th group, and 6-figure groups - the ballistic variation of the temperature, the direction and the speed of the ballistic wind, as in the 5th group.

2. If some part or other of the data is expressed by a number of figures less than that shewn above then the places of the missing figures in front of the number are filled by zeroes (0s), as in the second group.

Places with no data given at all are filled by nines (9s).

The minus sign before the negative meanings of the variations of pressure and temperature is not transferred. In this case in place of the minus the number 5 is added to the first figure.

3. An extra group is placed at the end of the bulletin beginning the data received by extrapolation.

(37) 4. Take the variation in atmospheric pressure from the 3rd group of figures in the bulletin and reduce it according to the rule to the height of the OP of the troop: for every 10m above the troop of the AMS the pressure changes by 1mm. Add this correction to the variation of the pressure, given in the bulletin, if the troop is lower than the AMS, or subtract it if the troop is higher.

5. Take from the bulletin the temperature, the direction and the speed of the ballistic wind corresponding to the height of the trajectory shewn in the firing tables, rounding it off to the nearest height shewn in the bulletin.

If the bulletin is composed partially according to data received by extrapolation, then for full preparation of it use only with the heights of the trajectory which increase by no more than 50% the height up to which proper observations of the AMS were made (extra group of the bulletin).

6. From the bearing of the fire subtract the bearing of the ballistic wind and thus the "wind angle" is obtained for the analysis of the wind into its constituent parts.

3. DETERMINATION OF THE CORRECTION FOR THE CHARGE

On the inside of the lid of the packing case for rounds with charges of pyroylin powder is stuck a label on which are shewn the size and mark of the variation in muzzle velocity of the shell (in %) from the velocity shewn on the table. The "+" mark shews that the muzzle velocity is higher than that on the table, the "-" mark shews that it is lower than that in the table.

If there is no label in the box this means that there is no variation in the muzzle velocity from that in the table, or that it is too small to take into account.

(38) B. Reference Information.

1. Information about the Gun.
2. Approximate marking of the Rounds.
3. Approximate marking on Packing cases.

(39)

Whole length of barrel ..... 5608mm. (56 klb.)

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Length of tube ..... 5350mm. (53.5 klb.)

Length of rifled part (from beginning of landes) ..... 4630mm.

Distance from outside surface of bottom of loaded shell-case to bottom of loaded OF-412 Fragmentation HE shell ..... 609mm.

Number of landes 40

Twist of rifling ..... Uniform

Length of movement of landes ..... 30 klb.

Volume of powder-chamber with OF-412 shell ..... 7.9 cu.dm.

Gun Mounting

Maximum angle of elevation ..... +18°

Maximum angle of depression ..... -5°

Horizontal field of fire ..... All-round

Normal length of recoil (with full charge) ..... 490-550mm.

Limit of length of recoil (with full charge) ..... 570mm.

Quantity of fluid (Steol M) in recoil brake ..... 6.4 litres

Quantity of fluid (Steol M) in recuperator ..... 4.4-4.6 litres

Initial pressure in recuperator ..... 53-57 at.

Weight of barrel with breech-block and opening mechanism..... 1430 kg.

(43) MARKING ON PACKING CASE

On the upper side of the box.

Ok sn PGM-6	- Shell capped with RGM-6 fuze;
00-4-0	- Number of factory which prepared fuze, batch number and year of preparation of fuze;
V-0-00	- Month, year and number of base which prepared the cap of the shell;
100-44,SU & Tank	- Brief designation of design;
N	- Weight mark of shell;
85kg. Gross	- Weight of box with rounds;
OSK-FUG	- Designation of shell;
2 pieces	- Quantity of rounds in box;
Full	- Designation of charge;
NDT-3 $\frac{18}{1}$	- Type of powder;

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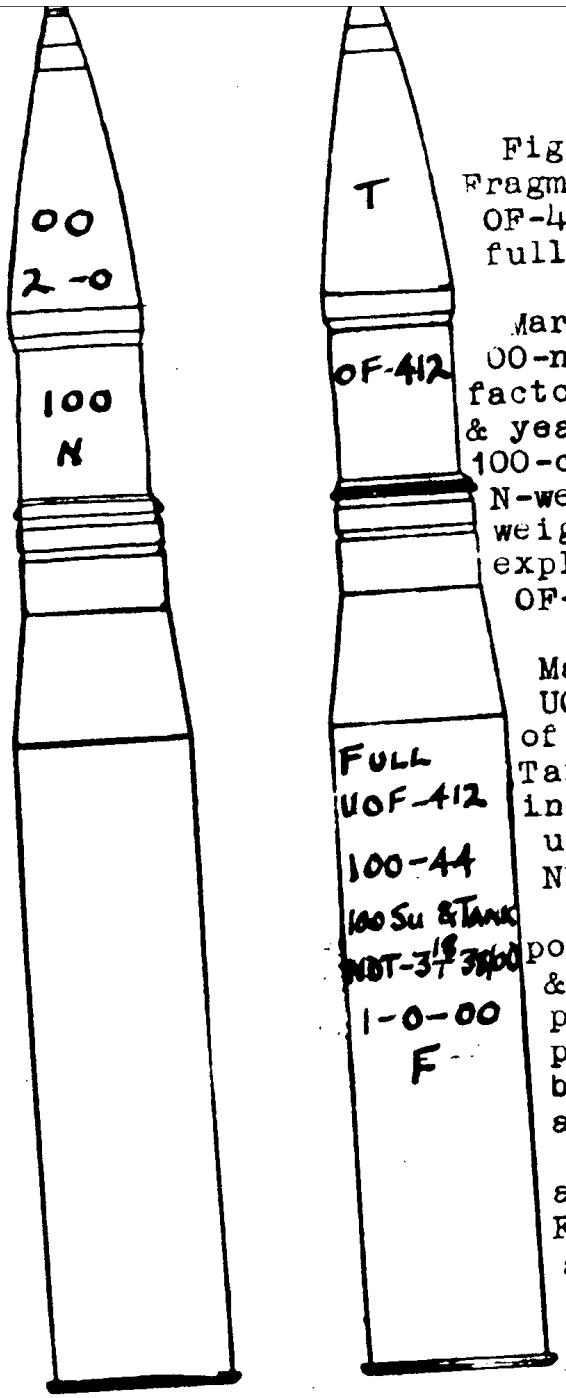

Fig.1 Round with Fragmentation HE shell OF-412(One-piece), full charge.

Marking on shell: 00-number of armament factory; 2-0 -batch number & year of filling of shell 100-calibre of shell; N-weight mark(standard weight)of shell; T-code of explosive material; OF-412-Index of shell.

Marking on shell-case; UOF-412 -brief index of round; 100-44, 100 SU & Tank-designation of gun, in which the round is used; 18 NDT-3 1 -type of powder; 38/0-batch number & year of preparation of powder; 0-index of powder factory; 1-0 - batch number & year of assembly of rounds; 00-Number of base which assembled rounds; F- round assembled with adulterant

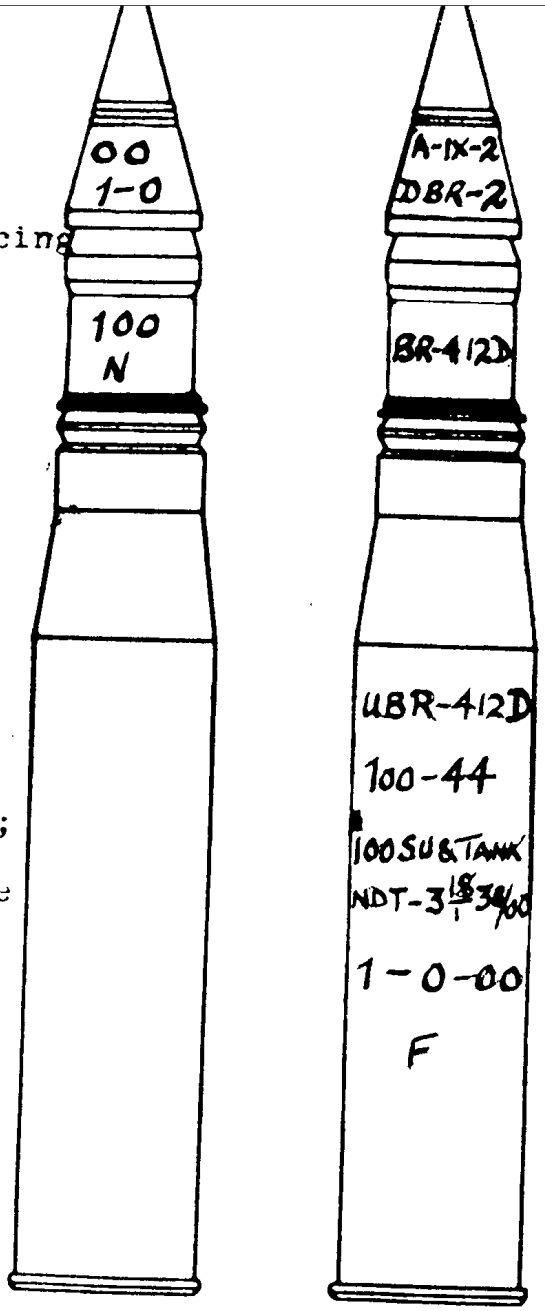

Fig.2. Round with armour-piercing tracer shell BR-412D(with armour-piercing and ballistic cap),DBR-2 fuze

Marking on shell

00-number of armament factory; 1-0 -batch number and year of filling of shell;100 -calibre; N -weightmark(standard weight) of shell;A-IX-2 -code of explosive material; DBR-2 - fuze;BR-412D -index of shell

Marking on shell-case

UBR-412D -Brief index of round; 100-44, 100 SU & Tank - designation of gun, in which the round is used;

NDT-3 $\frac{18}{1}$ -type of powder;

38/0 -batch number and year of preparation of powder;0 -index of powder factory;1-0 -batch number and year of assembly of rounds;00 -number of base which assembled rounds;F -round assembled with adulterant

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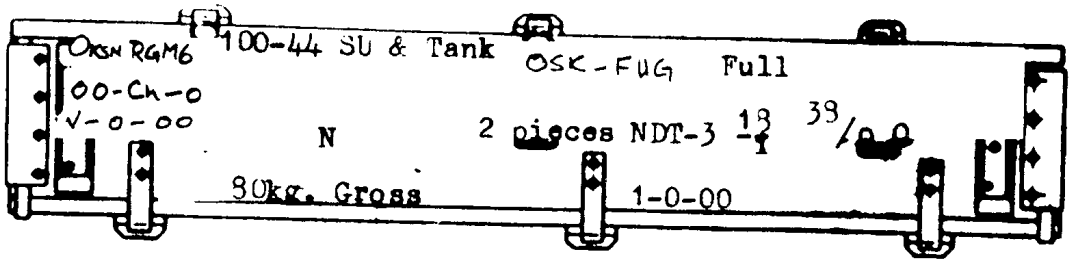
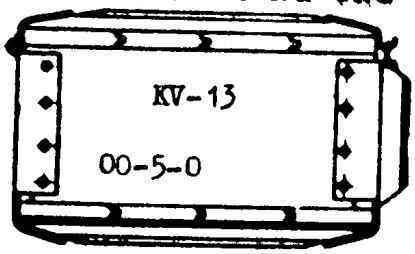
3. EXAMPLE MARKING ON PACKING CASE



On the left-hand end



On the right-hand end

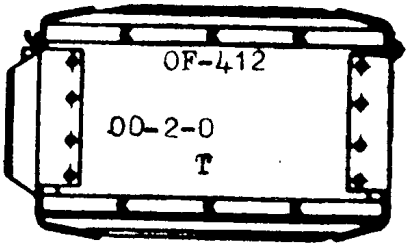


Fig.3 Packing case for shells.

& mark of powder factory;

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1-0-00 - Batch number, year of assembly and base which assembled the rounds.

On the left-hand side of the box.

OF-412 - Index of shell

00-2-0 - Number of factory which filled shell, batch number and year of filling;

T - Designation of explosive material;

On the left-hand side of the box.

KV-13 - Primer cup;

00-5-0 - Number of factory which prepared primer cup; batch number and year of preparation.

The basic distinguishing sign in the marking on packing cases with different rounds is the index of the shell inscribed on the right-hand side of the box.

(44)

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(58) (18 on diagram 3); clearance in each coupling must be not less than 0.3mm;

- weld locking plates 09-50 to the cover by means of electrode E42 Ø 4 mm; A clearance of up to 0.5 mm between the lower surface of the locking plates and the flat on the cylinder (sketch 23) is permissible.

RECOILING PARTS CATCH ON THE GUARD AS A RESULT OF BENDING OF THE LEFT OR RIGHT HAND SHIELD OF THE STATIC PART OF THE GUARD.

Produce an artificial recoil of the barrel and check whether the recoiling parts catch on the left or right hand shield of the static part of the guard.

When it catches take off the guard and correct the shield.

FAULTING AND REPAIR OF ANTIRECOIL APPARATUS

Fluid leak from recoil brake and recuperator (diagram 3)

Detach the moving armour-plating from the cradle and, having moved it forward by 80-100 cm, unscrew cap 07-24 from the internal cylinder of the recuperator.

With the aid of the prescribed equipment S642-102 for extracting the barrel withdraw the barrel 140-150mm and check whether the counterrecoil buffer rod brings
(59) out fluid and also whether the fluid filters through the compressor(?) of the piston of the counterrecoil buffer rod, packing rings, air valve and plug. After checking, screw on cap 07-24, fasten it with a screw, and put the moving armour-plating back in position.

Causes of faults:

THOSE COMMON TO RECOIL BRAKE AND RECUPERATOR

1. Pressed down or weakly tightened packing rings 07-22, 07-23, 08-18, 08-25 & 08-37 (diag.3)

Check whether fluid has filtered out of internal cylinder 07-38, the body of 07-17 gasket, the body of 18-39 gasket, the forward cap 08-22, plugs 08-26 and 08-38 in the positions of distribution of the packing rings.

If the fluid is leaking tighten the packing rings.

If the leak does not stop replace the packing rings by those prepared according to Appendix 1, sketches 134 and 136.

After either tightening or changing packing ring 08-18 check the position of locking plate 08-13 (sketch 24). The locking plate should be situated in the upper semicircumference in the 90° sector.

If the locking plate is not in the correct position, then put it in its new place, first of all threading the M4x0.7 thread in the body of the 08-39 gasket (sketch 24).

Drill the apertures for the thread according to the apertures in locking plate 08-13.

2. Rust on exterior surface of brake piston 08-42 and counterrecoil buffer rod 07-42. (Diagram 3). 50X1-HUM

If rust is found on the brake and recuperator rods, dismantle the recoil brake and recuperator and inspect every part.

In the case of unchromed rods, remove the rust, rubbing the affected parts with clean rag, or polish off by hand with hemp cord.

A light powder mixed with steol M may be used.

Remaining pits with smooth edges can be polished up to a metallic shine.

If there are areas of deep rust on the counterrecoil buffer rod the rod can be reconditioned by pouring babbitt (tin-antimony-copper alloy for bearings) over it (chart 7).

The breadth of the turn of the rod for pouring on the babbitt depends on the size of the affected part, but which must not be greater than 45mm.

Remove deep rust on the surface of an unchromed brake pistol or counterrecoil buffer rod, taking off the minimum layer of metal (chart 8).

If there is damage to the surface of the chrome on chromium-plated brake pistons and counterrecoil buffer rods change the recoil brake and recuperator (Appendix 1) or remove the layer of chrome [1] and the rust under the chrome (chart 8).

In the recoil brake

(61) 3. Collar gasket weakly tightened by means of nut 08-8 of S608-2 gasket (diag.3).

Take off the locking plate and tighten up the collar gasket.

If the flow does not stop, add a collar gasket or change the gasket (Appendix 1), after which plug the nut of the gasket with the locking plate.

If after changing the collar gasket the flow does not stop then the cause of the flow may be wearing by the pouring on of the babbitt of the aperture of the nut of the S608-2 gasket.

In this case pour on some more babbitt and treat as with the brake piston (chart 9).

In the recuperator

4. Compressor in the collar of the counterrecoil buffer rod only weakly held fast by means of gasket nut 07-20, and compressor of the piston of the counterrecoil buffer rod by nut 07-13 (diag.3).

Tighten up the compressor. If the flow does not stop add leather washers 07-18 and 07-9 to the collar and the piston (Appendix 1).

5. Collar gasket 07-30 only weakly held fast by compression nut 07-32 (diag.3).

Tighten the collar gasket. If the flow does not stop change the collar gasket (Appendix 1).

6. Ventilator cone 17-33 loosely adjoining the seat of the rear root 07-36 (19 on diag.3).

Check whether the fluid is leaking in the union of the valve cone with the seat in the rear root of the recuperator. 50X1-HUM

[1] The removal of a layer of chromium plating without subsequent [illegible] only permitted in time[illegible]

If there is a leak change [redacted] with the one prepared according to Appendix 1, sketch 135, or else trim the bottom of the seat with a countersink
(62) reamer or a drill with a flat bit and smooth the valve cone by grinding. 50X1-HUM

If even after this the flow does not stop, change the valve (Appendix 1, sketch 135).

7. Damage of rubber washers 07-8 and 07-16, and also damage or wear of leather washers 07-9, 07-18 and flange 07-31 (diag.3).

Change the unserviceable washers and flange[1] (Appendix 1).

8. Fracture of belleville springs 07-11 and 07-14 (diag.3).

Change the belleville springs (Appendix 1)

LEAKAGE OF NITROGEN FROM THE RECUPERATOR

Depress to its maximum the pivoting section of the gun and moisten valve cap 07-35 with soapy water. The formation of bubbles indicates the nitrogen leak from the recuperator.

Causes of fault:

Tube 07-41 is not completely filled with fluid (diag.3).

Elevate the pivoting section of the gun by 10-15° and unscrew the valve by a half-turn. When liquid appears in the T-piece aperture shut the valve quickly which will result in the hydraulic shut-off of nitrogen in the recuperator.

LENGTHENED RECOIL[2]

(63) The length of recoil is determined by the documents which accompany gun from the military unit which sent it for repair, or from the information given by the people coming with the gun.

The normal length of recoil in firing with full charge should be within the limits 490-550mm.

The limit of maximum recoil is 570mm.

In order to avoid receiving incorrect information from indicator 10-213 (diag.2) check its exactness. To do this try transferring recoil indicator 10-214 along the rule of recoil indicator 10-215.

The recoil indicator should be moved by hand and retained in the set position by the A51240-4 spring (10-216).

If the recoil indicator is not retained in the set position change the A51240-4 spring (10-216) by the one prepared according Appendix 1, sketch 146.

Causes of fault:

In the recoil brake

1. Faulty fluid.

Elevate the pivoting section of the gun 6°, unscrew plug 08-38 (diag.3) from the brake cylinder, and check whether fluid appears out of the plug aperture.

---

[1] When there has been a full change of unserviceable washers and flanges the gun should be tested by firing (Appendix 7).

[2] Guns which have gone into repair of a fault - lengthened recoil - after repair should be tested by firing (Appendix 7).

50X1-HUM

(63) If fluid does not appear then it is necessary to add more thus:

2. Wear of the 08-2 piston lining (diag. 3). 50X1-HUM

(64) Measure the exterior diameter of the piston lining and compare its size with the mean internal diameter of the brake cylinder[1], given in the manual of the gun.

The difference in diameters should be not greater than 0.4mm.

With a difference greater than 0.4mm. change the piston lining[2] (chart 10).

3. Wear of control washer 08-3 (diag. 3).

Measure the clearance where the eye of the regulating washer is in conjunction with the largest diameter of the variable gauge spindle. The clearance should be not more than 0.4mm.

Measure the clearance without taking the regulating washer off the spindle.

If the clearance is greater than 0.4mm, change the regulating washer and fit it over the largest diameter of the variable gauge spindle[2] (chart 11).

To take the old regulating washer off the spindle, unsolder the forward cap 08-22 and screw together with the spindle.

(65) Put a prepared regulating washer on the spindle and attach the forward cap with the spindle on to the solder POS 30 as per instructions (Appendix 6); screw on the cap up to the detainer.

Trim off the superfluous solder on the surface of the spindle protruding from the cap.

In the recuperator

4. Fluid fault.

Determine from the chart the quantity of fluid in the recuperator. This should be within the limits of 4.4-4.6 litres.

If the quantity is less than that indicated, fill the recuperator up to the norm and check by the chart a second time.

5. Faulty pressure.

Check by the pressure gauge the initial pressure in the recuperator. With the normal quantity of fluid this should be within the limits of 53-57 at.

If the initial pressure is less than that indicated then add more nitrogen, bringing the pressure up to normal.

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1. The mean internal diameter may also be determined in the following way. Measure the bore of the cylinder along two reciprocal perpendicular diameters for a distance of 700mm (from the forward end of the cylinder) every 50mm. Make the first measurement 70mm. from the forward end (on the side of the "biscuit" lugs). Add all these measurements together and divide the sum total by their number. The resulting figure will be the mean diameter.

2. After changing the piston lining or the regulating washer test the gun by firing. (Appendix 7).

3. Instead of screwing together the forward cap 08-22 the buffer may be taken off the spindle. To do this it is essential to drill a countersink for pin 08-16, knock out the pin and screw together the buffer. After fixing the regulating washer, screw the buffer on to the spindle as far as it will go, put in the pin prepared according to sketch 100, rivet it and trim it. 50X1-HUM

The length of the recoil is determined from the documents which accompany the gun from the military unit which sent it for repair, or from the information given by those coming with the gun. 50X1-HUM

The length of recoil with firing with full charge should be not less than 490mm.

Causes of fault:

(66) In the recoil brake.

1. 08-8 collar gasket over-tightened by S608-2 gasket nut (diag. 3)

Take off the locking plate. Loosen the tightened collar gasket by unscrewing the gasket nut. In order to avoid having a flow of fluid through the gasket after doing that, stop the gasket nut with the locking plate.

2. Bending of 08-40 spindle and 08-42 brake piston rod (diag.3).

Dismantle the recoil brake.

Set the spindle and the rod on the prisms and check their "play" with the indicator, or with the aid of a marking gauge and feeler.

The play of the spindle should not be more than 1.2mm, and that of the brake piston rod not more than 0.6mm.

If the respective plays of the spindle and brake piston rod are greater than those shewn above straighten the spindle and the rod by means of pressure on the rod-straightening apparatus, i.e. applying pressure without heating (sketch 25).

3. Catching of 08-19 buffer valve (valve not withdrawing from 08-15 buffer shear: diag. 3).

buffer valve must move freely, and without catching, over the end part of the spindle.

If the valve does catch, trim the raised metal on the end part of the spindle and in the buffer valve aperture, but without scratching.

4. Bulging 08-2 piston sleeves (on guns newly delivered; diag. 3)

Measure the external diameter of the piston sleeve on two reciprocally perpendicular diameters every 12mm; the first measurement should be made at a distance of 4mm, from the forward end of the sleeve.

(67) By the actual measurements of the lining establish whether there are any bulges in it. If there are change the rod lining[1] (chart 10).

In the Recuperator

5. Surplus of fluid

Check according to the chart the quantity of fluid in the recuperator. This should be within the limits of 4.4-4.6 litres.

If the quantity is greater than that shewn remove the surplus fluid and check a second time.

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(65) 1. A gun having come for correction of a fault - shortened recoil - should be tested by firing after repair (Appendix 7).

(67) 1. When there has been a change of rod lining, test the gun by firing (Appendix 7).

6. Surplus of pressure [redacted] 50X1-HUM

With a pressure gauge check the initial pressure in the recuperator. With the normal quantity of fluid this should be within the limits of 53-57 a+ 50X1-HUM

If the initial pressure in the recuperator is greater than that shewn above, release the surplus nitrogen, bringing the pressure down to normal.

7. Packers in the collar of the recuperator rod overtightened by 07-20 collar nut, and packers of the piston rod of the recuperator by the 07-13 nuts (diag.3)

Loosen those of the packers in the recuperator rod collar which are over-tightened, and unscrew collar nut 07-20, but in such a way that the fluid will not leak.

Depress the pivoting section to its maximum and release the nitrogen from the recuperator, bringing the pressure down to atmospheric. Replace the pivotings section back at horizontal and unscrew the nut from the recuperator rod.

With the aid of the S642-411 implement for determining the quantity of fluid, draw the recuperator rod out 300-400mm and take the implement off the rod.

(68) Bring the pressure in the recuperator up to 2-5 at., then the recuperator rod should begin smoothly and without jerks to move into the recuperator cylinder.

If the recuperator rod will not go in, dismantle the recuperator and loosen those of the piston rod packers which are tightened by 07-13 nuts, after which assemble the recuperator and before re-installing it on the gun check whether the packers have tightened correctly. This is determined on the basis of whether the recuperator rod (which has been drawn out 300-400mm) will go in at a pressure of 2-5 atmospheres in the recuperator.

8. Bending of 07-42 recuperator rod (diag.3).

Dismantle the recuperator.

Set the rod on the prisms and check its bending with the indicator or with the aid of a marking gauge and feeler.

Bending of the rod should not exceed 2.4mm.

When the bending is greater than 2.4mm. straighten the rod with a press on the rod-straightening implement, i.e. by press - clamping without heat.

In the coupling of the cradle and the barrel.

9. Increased friction in the coupling of the cylindrical part of the barrel with the 09-53 cradle bushes (diag.1).

Take off the barrel and check whether there are scratches on the bushes or adherences of bronze or brass on the cylindrical part of the barrel.

Trim the raised metal on the bushes and beading of bronze or brass on the cylindrical part of the barrel, after which set the barrel in position.

(69) Non-return to battery or counterrecoil with jerks[1]

The nature of the counterecoil is determined by the documents accompanying the gun from the unit which sent it for repair, or from the information given by those personnel coming with the gun.

Non-returns to battery and counterrecoils are not permissible.

Check the state of the cap in order to avoid non-returns to battery as a result of dirt in the air-escape aperture of the 07-24 cap. 50X1-HUM

1. A gun which has been sent for correction of non-return to battery or counterrecoil with jerks should be tested by firing (Appendix 7).

In the recoil brake

50X1-HUM

1. Collar gasket 08-8 over-tightened by gasket nut S608-2 (diag.3).

Cp. "Shortened recoil", Appendix 1.

2. Nicks and scratches on the 08-2 rod lining and 08-15 buffer (diag.3).

Dismantle the recoil brake and inspect the rod lining and the buffer.

Trim the raised metal.

If after trimming the fault is not corrected, change the rod lining and buffer[1] (charts 10 & 12).

3. Bulges on 08-2 rod lining (with guns discharged for the first time; (diag.3).

(70) Cp. "Shortened recoil", Appendix 4.

4. Bending of the 08-40 spindle and the 08-42 brake rod (diag. 3).

Cp. "Shortened recoil", Appendix 2

5. Packers in the gasket of the countercoil buffer rod over-tightened by 07-20 collar nut and packers of recuperator piston by 07-13 nuts (diag. 3).

Cp. "Shortened recoil", Appendix 7.

6. Fluid fault.

Cp. "Lengthened recoil", Appendix 4.

7. Faulty pressure

Cp. "Lengthened recoil", Appendix 5.

8. Wear of 07-42 countercoil buffer rod (diag. 3).

Cp. "Shortened recoil", Appendix 8.

In the coupling of the cradle with the barrel

9. Increased friction in the coupling of the cylindrical part of the barrel with the 09-53 cradle bushes, and also in the coupling of the 09-101 cradle cotters with the guiding surfaces of the groove of the 01-8 cotter (diag. 1).

Take off the barrel and check whether there are any adherences of bronze or brass on the cylindrical part of the barrel and scratches on the cradle bushes, and also on the cradle cotter and the guiding surface of the 01-8 cotter groove.

Trim the bronze or brass beadings and the raised metal, after which set the barrel in position.

(71) ABRUPT COUNTERRECOIL (1)
(Counterrecoil with knocking)

The nature of the counterrecoil is determined from the documents accompanying the gun from the military unit sending it for repair, or from the personnel accompanying the gun.

The counterrecoil should be smooth and without knocking.

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1. When a rod lining and buffer has been changed test the gun by firing (Appendix 7).

In the recoil brake

1. Fluid fault

Cp. "Lengthened recoil", Appendix 1.

50X1-HUM

2. Catching of 08-19 buffer valve, as a result of which the valve does not go right up to 08-15 buffer shear (diag. 3).

Dismantle the recoil brake.

The buffer valve should move freely and without catching along the end part of the spindle.

If the valve does catch, without scratching trim the raised metal on the end part of the spindle and in the aperture of the buffer valve.

3. 08-19 buffer valve loosely adjoining the 08-15 buffer shear (diag. 3).

Clamp the valve to the buffer shear, pour in paraffin through the aperture in the buffer and check whether the paraffin leaks between the valve and the buffer shear.

(72) With a leakage of paraffin reset the valve against the buffer shear so that where their surfaces adjoin there are no gaps. Reset the valve with GOI paste or a light abrasive powder with steol M.

After resetting a second time check whether the paraffin leaks between the valve and the buffer shear.

4. Wear of 08-15 buffer (diag. 3).

Measure the external diameter of the buffer and compare its size with the size of the minimum diameter of the bore of the brake rod[1], as shown in the manual of the gun.

The difference in diameters should be not more than 0.25mm.

With a difference greater than 0.25mm. change the buffer[2] (chart 12).

In the recuperator

5. Excess fluid

Cp. "Shortened recoil", Appendix 5.

6. Excess pressure

Cp. "Shortened recoil", Appendix 6.

In the cradle

7. Corrosion of S609-20 shock absorbers (diag. 1).

Change the unserviceable shock absorbers by those prepared according to Appendix 1, sketch 138.

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(71) 1. A gun which has been sent for correction of abrupt counterrecoil should be tested by firing after repair (Appendix 7).

(72) 1. In the absence of measurements of the brake rod in the manual determine the minimum internal diameter by measuring the bore of the rod. The measurements should be taken of two reciprocal perpendicular diameters every 50mm for a distance of 720mm from the end of the rod; the first measurement taken 90mm from the end of the piston rod.

(72) 2. With a change of buffer test the gun by firing (Appendix 7). 50X1-HUM

(73) RUST IN THE BRAKE CYLINDER, THE INTERNAL AND EXTERNAL CYLINDERS OF THE RECUPERATOR, IN THE BORE OF THE BRAKE ROD, AND ON THE SPINDLE. 50X1-HUM

50X1-HUM

Clean off rust in the external cylinder of the recuperator with a wire brush.

With deep rust on the surfaces of the parts shewn above or with a defective (bulging) layer of chromium on the chromium plated internal cylinder proceed as follows.

Remove deep rust from the brake cylinder, the unchromed internal cylinder, of the recuperator, the bore of the brake rod, and the spindle, removing the minimum layer of metal from all of the surfaces, and in the external cylinder of the recuperator perform local trimming.

In the case of damage to the layer of chrome on the chromed internal cylinder of the recuperator change the recuperator (Appendix 1) or remove the layer of chrome[1] and the rust underneath it (charts 8, 13 & 14).

After removing the rust from the bore of the brake cylinder the diameter of the bore should be less than the internal diameter of the thread of the cylinder (for the body of the 08-39 gasket) by at least 0.2mm.

(74) In the event of there being a need for a considerable increase in the diameter of the bore of the cylinder, suitably deepen the thread of the cylinder.

The remaining shallow cavities on the internal surface of the brake cylinder with smooth edges may be brought up to a metallic shine in that condition of trimming.

The remaining cavities on the internal surface of the internal recuperator cylinder are permitted to remain providing they do not cause scratching of the 07-9 leather washers of the piston of counterrecoil buffer rod or a leaking of fluid through the packers of the piston of the counterrecoil buffer rod.

The remaining cavities should be brought up to a metallic shine.

BREAKING OF THE THREADED JOINT OF THE 07-6 PISTON BODY WITH THE 07-42 COUNTERRECOIL BUFFER ROD. (On the guns of first issue)

(Diagram 3)

Check whether there is any unsteadines in the threaded joint of the piston body with the counterrecoil buffer rod. No unsteadiness is permissible.

If there is any unsteadiness it is essential:

To unscrew the two 07-13 nuts and take all the parts out of the piston body.

To heat the piston body in the furnace up to a bright yellow iridescence and while it is in this hot state immediately tighten (screw up) the piston body as far as it will go with the key; pierce and bore an apperture of $6^{+0.08}$ mm in the piston body and the counterrecoil buffer rod (sketch 26);

(75) - to countersink an aperture on two sides at an angle of 90° to a depth of 2mm;

- to prepare an 07-14 pin (sketch 26);

- to insert the pin into the aperture, spread it on two sides and trim the end of the pin flush with the surface of the piston body;

1. It is only permitted to remove the layer of chrome without subsequent rechroming in time of war. 50X1-HUM

SECRET

- clean off the soot from the surface of the piston body and the rod and assemble the piston r

HOLLOWS AND HOLES[1] IN THE RECUPERATOR BRAKE CYLINDER AND IN THE INTERNAL CYLINDER OF THE RECUPERATOR 50X1-HUM

Remove the protuberances on the internal surface of the cylinders produced by the hollows in the external surface (chart 15). Weld up the holes measuring up to 15mm, and seal those greater than 15mm but not greater than 80x80mm in the brake cylinder and those not greater than 50x75mm in the internal cylinder of the recuperator by welding in inserts (chart 15).

If it is impossible to remove the protuberances on the internal surface of the cylinders, cut out the damaged parts and seal the cylinders with inserts.

If there are holes in the internal recuperator cylinder greater than 50x75mm change the recuperator (Appendix 1).

50X1-HUM

1. Sealing holes in the cylinders is permitted only in time of war.

(88) with the breaking off of 2 or 3 teeth from the segment, put in an insert (chart 19). 50X1-HUM 50X1-HUM

In the case of teeth of the cog wheel breaking off to any distance and a height not greater than 5mm from the top, or up to 25mm in length and any height, weld a layer of metal on to the damaged teeth by an E50A ⌀ 4mm electrode and trim according to a gauge prepared from the outline of a serviceable tooth. With teeth breaking off to a distance greater than 25mm and a height greater than 5mm from the top, insert a dowel (chart 20).

DAMAGE AND REPAIR OF SIGHTING EQUIPMENT

STIFF MOVEMENT OF THE MECHANISM OF THE SPIRIT LEVEL

Test the mechanism by operation.

Causes of fault:

1. 10-63 spirit level worm over-tightened by A51011-34 nut (diag. 2)

Adjust the movement of the mechanism, unscrewing the nut and making sure that the worm has no axial motion.

2. Bending of the indicator of the 10-60 spirit level base (diag. 2).

Turning the spirit level worm check whether the 10-60 spirit level base catches on the 10-59 spirit level casing.

(89) If there is any catching dismantle the spirit level and straighten, straightening the indicator of the spirit level base without heating (cp. "Checking of spirit level").

3. Over-tightened 10-67 spirit level base screw (diag. 2).

Adjust the movement of the mechanism, loosening the screw.

4. Catching in the join of the 10-63 spirit level worm with the worm gear of the 10-60 spirit level base as a result of bending of the worm (diag. 2).

Test the mechanism by operation; in the places where the worm is bent catching will be observed.

Replace the unserviceable worm (Appendix 1, sketch 139).

5. Fracture or settling of the 10-69 spring (diag. 2)

Withdraw the 10-63 worm from the spirit level casing.

Withdraw the 10-60 spirit level base 1.5 - 2mm and release. The spring should return the spirit level base to its original position.

If the base does not return to its original position, replace the spring by one prepared according to chart 4.

DIFFICULT USE OF SPIRIT LEVEL

Reasons of fault:

1. Insufficient sensitivity of the air bubble in the level.

Slowly turning the flywheel of the 10-63 spirit level worm trace the movement of the bubble of the level. The bubble should move smoothly in the ampoule, without jerkiness.

If the movement of the bubble is not smooth replace the Sb10-15 level (Appendix 1).

50X1-HUM

(90) 2. Fracture or settling of the 10-56 tube of the level, as a result of which the Sb10-15 level is pulled(?) in the 10-60 spirit level base.(diag. 2) 50X1-HUM

Replace the Sb10-15 level (Appendix 1).

CHECKING OF THE SPIRIT LEVEL

Place the tank on a flat area with neither longitudinal nor lateral heeling.

Set the calibrated regulating level along the line of graduations on the control platform of the barrel.

Revolving the flywheel of the elevating mechanism of the gun, bring the bubble of the control level to the centre.

Revolving the flywheel of the 10-63 spirit level worm, bring the bubble to the centre. At this stage the indicator of the spirit level base should be against the 0 graduation of the scale on the spirit level casing (no disagreement greater than 10 thousandths is permitted), and the 0 graduation of the scale on the 10-62 graduated ring - against the indicator of the spirit level casing.

If the 0 graduation of the scale on the ring should not be against the indicator, then loosen the 10-64 screw and turn the 10-62 graduated ring round so that the 0 graduation is against the indicator on the casing, after which tighten up the ring again with the 10-64 screw.

If there is a disagreement between the indicator of the spirit level base and the 0 graduation of the scale on the casing greater than 10 thousandths, take the indicator off the base and fix a new one against the 0 graduation of the scale on the casing.

(91) DISPARITY BETWEEN THE SPIRIT LEVEL READINGS AND THE ACTUAL ANGLES OF ELEVATION OF THE BARREL

Checking takes place in the case of faulty zero laying of the spirit level (cf. above "Checking of the spirit level").

Set the tank on a flat surface with neither longitudinal nor latitudinal heeling.

Turning the 10-63 spirit level worm in an anti-clockwise direction set on the spirit level scale -0 -50 (-3°).

Working the elevating mechanism of the gun bring the bubble of the spirit level to the centre (between the centre graduation lines on the ampoule of the level).

Determine the angle of depression of the barrel with the aid of a quadrant set on the control platform along the graduation line.

Such checking should be made every 50 thousandths up to the maximum angle of elevation of the barrel, turning the 10-63 worm all the time in an anti-clockwise direction, and then, decreasing the angles of elevation of the barrel, do a check on the same angles in the return sequence. In this case work the spirit level by turning the worm only in a clockwise direction.

Discrepancies between the readings of the quadrant and those of the spirit level should be not more than 2 thousandths.

Causes of fault:

1. 10-63 spirit level worm only weakly tightened by the A51011-34 nut (diag. 2).

Check whether the worm has any axial motion.

(92) If there is any axial motion of the worm tighten it up by the nut, but in such a way that the movement of the spirit level mechanism is not stiff.

 50X1-HUM

2. Settling or fracture of the 10-55 spring washer (diag. 2).

Replace the spring washer by one prepared according to Appendix 1, sketch 140.

3. Buckling or fracture of 10-61 spring (diag. 2).

Replace the spring with one prepared according to chart 4.

4. Bending of the 10-160 left shield of the immobile part of the guard (diag. 2).

If, in the absence of defects 1-3, or after their elimination, the readings of the spirit level do not correspond to the actual angles of elevation of the barrel, check whether the left shield is bent.

If it is bent, remove the spirit level, straighten the shield replace the level, and check once again whether the spirit level readings match the actual angles of elevation of the barrel.

If the straightening of the shield has not succeeded in eliminating the discrepancies of the spirit level readings, it is permissible to put packing washers of steel of any type on to the 10-97 pin under the forward or the rear part of the base of the 10-59 level casing.

CHECKING OF THE TELESCOPIC JOINTED SIGHT

Carry out the checking of the sight in sequence and by the means indicated in the Servicing Manual of the 100 mm tank gun.

Guns may go into repair with TSh2-22 sights. TSh2-22 sights may be set in 09-312 brackets.